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VIEWS, NEWS AND INTERVIEWS.

A Buffalo man has invented an instrument which he calls the "Telephotus." It is designed for communication between vessels at sea, for lighthouses, lightships and for general employment in the United States Signal Service. The apparatus consists of 106 incandescent lamps which are operated by a key-board something on the principle of a typewriter. A code of signals founded on the Morse telegraph alphabet is used, and experiments have shown that signals can be read for a distance of 15 miles.

Edison says that the man of the future may do without sleep entirely. If this statement is ever realized and a dozen or so men each undertake and accomplish as much as he has done, his spirit, a hundred years hence, if it takes a notion to visit this earth, will not recognize the old place.

An English electrician, connected with the post office department, claims that he has sent a telephone message three miles through the air without the use of a wire. The practical possibilities that suggest themselves are almost too startling to attempt to name. The theoretical possibilities are far beyond the reach of the wildest dreams of the imagination of the most visionary of such quasi-scientists as Flammarion and Jules Verne. What are we coming to? At this rate is there any necessity for limiting ourselves to such a mere bagatelle as space? Interplanetary communication will be carried on at fixed rates. We will be enabled to speak with anybody at any place and at any time. Dream after dream will be realized, until we wake up to the fact that the whole scheme may possibly be some well conceived and choice morsel for the delectation of plethoric pursed investors.

The board of aldermen at a recent session granted to the Providence Telephone Company the right to construct and maintain underground conduits for its wires. The conduits are to be so constructed that the fire alarms and police signal wires may be placed therein. Any part of the system shall be removed or changed on 90 days' notice from the city. The Telephone Company is further required to pay to the city an annual tax equal to one and a half per cent. upon the gross receipts of its business derived from the rental of telephone instruments located in the city. It really seems as if these aldermen imagine that a telephone company goes into business for the benefit of its health.

Platinum is on the rise. This is not welcome news to incandescent lamp manufacturers, particularly as it is impossible to work platinum mines during the winter, therefore, the supply can only come from the quantity now on hand. Still we notice incandescent lamps are cheaper than ever.

At Powhattan, Kan., during the strike of the Rock Island telegraph operators, an employé named Baird, who was placed in the station to succeed a striker, was waited upon, violently thrown on a passing train, and told that if he came back he would be strung up. The depot building was almost demolished with axes and rocks and other damages done. In localities in the neighborhood other outrages have been perpetrated. Switches have been spiked and numbers of human lives thus imperilled. Summary measures should be immediately adopted to put a stop to these uncalled for and disgraceful actions of the strikers, and a few examples made of these law-breaking individuals would have a salutary effect.

The wonderful results attained in the employment of electricity for welding has done a great deal to elevate the blacksmith.

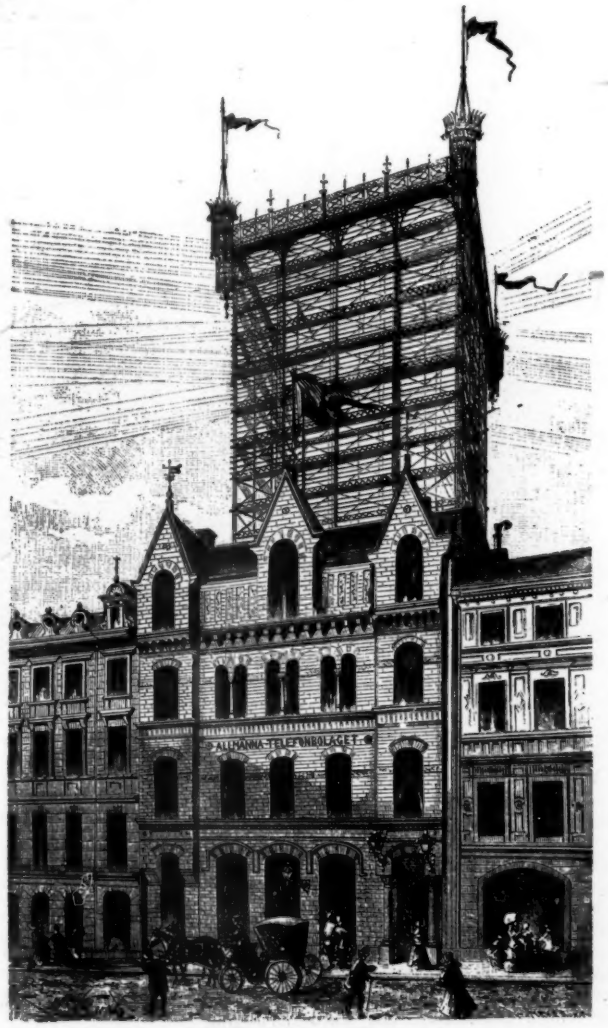

FIG. 1.—EXTERIOR VIEW OF THE TELEPHONE BUILDING AT STOCKHOLM, SWEDEN.

Many heretofore impossible pieces of welding are now done with the greatest ease. Well has the real inventor of this process fulfilled his part in life, and were he to do nothing else, by giving to the world a process so generally useful, he would have done more than his share.

The Japanese government has sent to this country within the last few years a number of its brightest young men, some of whom have taken honors in their respective collegiate courses. The government is at present fitting out a cable-laying steamer to be manned by native engineers.

The companion of a young lady telephone operator tells the following of her chum, who had recently been employed by the telephone company in St. Joseph, Mo.: "She went to work at the telephone exchange a few weeks ago, and about midnight one night I heard strange noises coming from her room. I went to the door and looked in. There was the girl with the corner of a sheet tightly twisted into the shape of a switchboard plug, desperately punching away at imaginary holes in the air and loudly calling in her dreams: 'Hello? Number? They're talking now.'"

In a recent suit against the Western Union, the plaintiff sued to recover the price of a telegram sent October 27, 1891, to the plaintiff at Wellfut, Mass. He claimed that owing to the fact that the defendant failed to deliver the message he lost $500. A lower court awarded the plaintiff $100 damages, but Judge Blodgett, of Boston, limited the damages against the defendant to 35 cents received by the company.

The Telephone in Sweden.

BY HJALMAR VAN KOHLER.

On the 14th of February, 1875, Mr. Graham Bell applied for a patent on the telephone in Washington. The following year Mr. H. T. Cedergren, an engineer of Stockholm, put up the first telephone in Sweden, and now, 16 years later, there are 8,010 telephones in use in Sweden, of which 7,410 are used in Stockholm and its environs, the number of girls employed being 200. The first start as to the general use of telephones was made in 1880 by the "Stockholm's Bell Telephone Stock Company," which company opened the first telephone system in September, consisting of 121 lines. But the rent for the use of such a telephone was considered too high for the general public—therefore, the telephone could not answer its intended purpose. After a committee had been formed by the members of the Society, who were owners of real estate in Stockholm, the President of the Bell Company was asked to lower the price. The company, however, could not give their consent to the proposal; but on the 19th of February, 1883, Engineer Cedergren issued an invitation to form a new company which would enable them to lower the rates for the public telephones, and that it should be stated in the statutes of the same that the company would not, at the expense of the subscribers, get an unreasonably large profit. In order to reduce the price for those who could not afford a telephone of their own, automatic "switches" were invented and put up by Engineer Cedergren and Mr. L. M. Ericsson; the latter was a skilled manufacturer of the telephone. The new telephone company was organized on April 13, 1883, and Mr. Cedergren was elected president. This company set to work at once, using the Swedish apparatus exclusively, as those made by Mr. Ericsson's factories were the best in the market. As the city of Stockholm is naturally divided into three sections by water, the company first began with the central station on July 11, 1883. From that time it has increased to the above mentioned number, and all the lines are metallic circuits, consisting of overhead cables and wires.

To give the reader an idea of the apparatus and materials used by this company, the accompanying illustrations are presented.

A general view of the exterior of the company's building in Stockholm is shown in Fig. 1. The immense wire tower is of rather novel construction and forms an important architectural element of the building design. In Fig. 2 are shown two multiple switchboards for 200 subscribers, each with lateral annexes. The capacity of these boards is 2,500 lines. An artistically designed wall set for terminal stations is illustrated in Fig. 3. Two Leclanché cells placed in the lower part of the apparatus are used with this set. The set is provided with receiving instruments, call bell, lightning protector, terminals for attaching metallic circuits or ground return, and contacts for attaching an extra call bell. A desk or library set is shown in Fig. 4. This is provided with two bell handles for convenience in signaling.

A novel switch is also used as a part of the apparatus of the system. The object of this switch is to connect five subscribers with the central station by means of one line. The switch is managed by the staff of the station by means of galvanic currents from a suitable large battery. When the line is occupied by one of the subscribers the others are shut off, wherefore those switches are suitable only for subscribers who do not use the telephone very frequently. An automatic switch for two lines, intended for the same use as the preceding one, is also in use.

Finding that the above mentioned company proved a great success, the government took up the idea of building telephones, and it now monopolizes the communication throughout the whole of Sweden, leaving those who really developed their system to an extraordinary extent, to operate within a boundary including Stockholm and its environs, or, 70 kilometres from the center of Stockholm. The government telephone system consists of 60,000 apparatus, of which 1,400 are used in Stockholm. They are all made by Engineer L. M. Ericsson. These two telephone systems can also be combined and made use of by the public at an extra payment. Thus, by the use of the two excellent systems, the Swedes have telephonic communication over the whole of their country. Underground wires are used in Stockholm for the government telephones, and a practical invention in that line is used, made by Engineer Hultman, consisting of cement blocks of a certain length placed in succession and kept in position by iron rods fastened in grooves lengthwise over the joints, which iron rods are kept in position by filling the grooves with cement. In order to keep out the sand and mold, the joints are covered with tarred canvas and a kind of putty, made of pitch and asphaltum. There are no iron pipes or tubes of any kind for the cables, which are placed in the canals of the cement blocks.

Mr. J. Levin, of Minneapolis, assistant superintendent of the Western Union Company, has completed arrangements for opening a city telegraph office in Pierre, S. D.

One of the families whom Jay Gould has made enormously rich are the Creightons, of Omaha. When the Western Union telegraph line reached the Missouri river, the Creightons took it up and continued it to the Rocky Mountains. They furnished the poles and put them up along the line of the Union Pacific ready for the wires. When the day of settlement arrived there was no money to pay them. The Creightons protested, for they had staked everything on

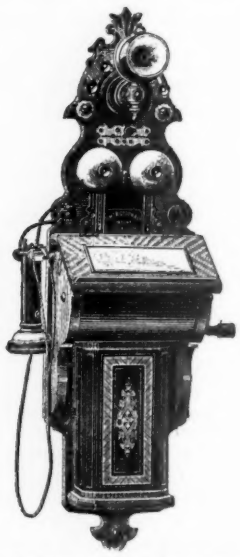

FIG. 3.—SWEDISH WALL TELEPHONE SET.

their contract. Finally, a settlement was made, the Creightons taking payment of their claim in Western Union stock at ten cents on the dollar, and they held their stock. Now the Creighton coupons form a big share of the clearings at Omaha on interest payment days.

World's Fair News.

Individual judges, not big juries, will award the medals and diplomas to exhibitors at the World's Fair. The judges will be selected from American and foreign countries, in proportion to the number of exhibits from each. The relative number of domestic and foreign judges cannot be given at this time. It will not be known until the catalogue is almost ready, when the committee of awards will know the relative number of domestic and foreign exhibitors. An important innovation is that these judges shall say, in their award of medals and diplomas, why they give those coveted prizes to certain exhibitors. The specific points of excellence must be stated in each case.

The plans were agreed upon at the meeting held Monday, December 12, by the full committee of awards, and was proposed by John Boyd Thacher, of Albany, N. Y. Mr. Thacher is chairman of the executive committee of the awards board. This committee is composed of John Boyd Thacher, William J. Sewell, New Jersey; A. T. Britton, District of Columbia, and Alex. B. Andrews, North Carolina. This committee, after a number of meetings, agreed to the plan proposed by Mr. Thacher. When the meeting was called, there were present: B. B. Smalley, Vermont; John Boyd Thacher, New York; A. M. Cochran, Texas; Thomas L. Williams, Tennessee; William J. Sewell, New Jersey; A. T. Britton, District of Columbia; Oscar Hundley, Alabama; Professor King, Iowa; Mark McDonald, California, and A. B. Andrews, North Carolina.

In presenting the single judge plan agreed upon by the executive committee of the awards board, Mr. Thacher said the conduct of an international exposition could be divided into three departments:

First, the erection and appropriation of grounds and buildings; second, the classification and installation of the exhibits; third, the pronouncing of judgment upon the article presented for exhibition. Mr. Thacher said the last two departments were exclusively under the control of the national commission. They mark the fair as a national and international undertaking, and when judgment is pronounced upon an exhibit it bears distinctively the stamp of the United States government.

The following rules and regulations, designated as the American system of awards, were adopted by the committee:

This board of judges, which shall be composed as far as practicable of competent experts, shall be divided into 13 committees, one of which shall be assigned to each of the 13 great departments of the Exposition as recognized by the classification of the World's Columbian Commission. The number of judges composing this board and each committee shall hereafter be determined.

As directed by the World's Columbian Commission, the character of the awards shall be as follows: "Awards shall be granted upon specific points of excellence or advancement, formulated in words by the board of judges or examiners, who shall be competent experts."

The individual members of said committee shall be, as far as possible, competent experts, and shall perform such duties and examine such exhibits as shall be assigned them by the executive committee on awards. There shall be a representation upon each one of these 13 committees, and the number of foreign judges will be fixed when the character and the extent of the participation

FIG. 4.—SWEDISH DESK TELEPHONE SET.

of the various foreign nations shall be ascertained.

ORGANIZATION OF EACH COMMITTEE.

Each committee shall, at the call of the executive committee on awards, organize by the election of a president, vice-president and secretary, and shall keep a record of all returns and reports by the individual judges, as hereinafter provided for.

It shall be the duty of each individual judge to formulate, in written words, the specific points of excellence or advancement of each exhibit which he deems worthy of receiving an award. He shall sign and submit this report as soon as possible to the committee of which he is a member, for its prompt action, and when confirmed by a majority of said committee the report shall be sent to the executive committee on awards.

Should the committee in any department reject the report of an individual judge it shall be its duty to communicate its action at once to the executive committee on awards, and the said executive committee may either confirm the action of the individual judge or appoint another judge, who may, or may not, be a member of the board of judges. Under the provisions of Rules 5 and 6 the executive committee on awards shall have the right to call to its assistance any member or members of the committee on awards.

This executive committee on awards shall communicate, through the State department of the United States, or through the director general of the World's Columbian Expositon, with the foreign governments which have appointed commissions to represent them at the World's Columbian Exposition, or with the said commissions directly, stating the character of the awards, the grounds upon which they are to be granted, and the requirement that all judges shall be, so far as is practicable, competent experts. And the foreign governments shall be invited to recommend, previous to February 15, 1893, experts in the various departments, and from those named the executive committee on awards may make selections. The especial attention of foreign governments shall be called to the fact that there will be but one class or kind of medals, which will be made of bronze and be works of art, and be accompanied by parchment diplomas on which shall be formulated the specific points of excellence presented by the exhibit receiving the award. Notice shall be given to all exhibitors, whether domestic or foreign, that the medals and diplomas to be awarded are by authority of the Congress of the United States, to be prepared by the Secretary of the United States Treasury, and that the holder of any medal, properly awarded to him, may have duplicates thereof made at his own expense, from gold or silver, at any of the mints of the United States.

Should any exhibitor, domestic or foreign, become a judge, under these rules, his exhibit shall be considered *hors concours*.

RIGHTS OF THE EXECUTIVE COMMITTEE.

The executive committee on awards, through its regularly appointed judges, shall have the right to examine every exhibit, domestic or foreign, whether presented by an individual, association of individuals, institution, government or department thereof; but mention shall only be made of those exhibits presenting meritorious character and excellence.

The work of the judges shall commence not later than the first day of June, 1893, and shall progress uninterruptedly until the completion of the work assigned them, except in the department of live stock and in those departments where the nature of the exhibits requires renewal, from time to time, during the Exposition.

Upon the completion of the work of the judges, and after its confirmation by the executive committee on awards, the awards shall be decreed and there shall be a formal and public announcement of the awards made, with ceremonies appropriate to the occasion, which ceremonies shall be under the direction and control of the committee on awards.

In addition to the reports by the individual judges on the various exhibits, each of the 13 committees shall present a comprehensive report, signed by the president and secretary, embodying the principal educational and interesting features of the groups and classes composing that department, accompanied by a list of exhibitors who have received awards, with the reasons and considerations therefor.

In the performance of the duties intrusted to this executive committee on awards, any member thereof shall have the right to be present at the deliberations of any of the committees above mentioned. M. J. B.

Chicago, December 13.

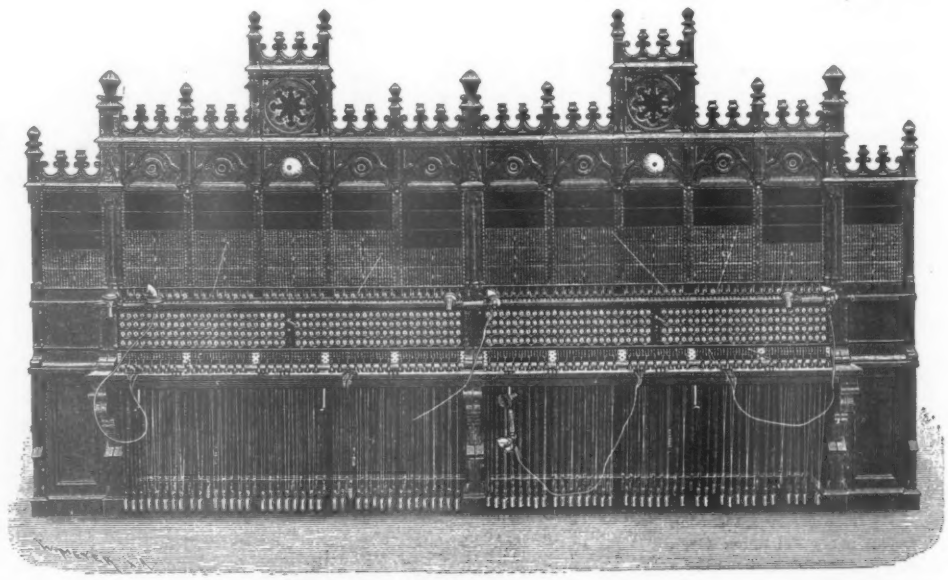

FIG. 2.—SWITCHBOARDS IN USE IN THE TELEPHONE EXCHANGE AT STOCKHOLM, SWEDEN.

All of last week a heavy fog hung over the country west of Chicago, through which many telegraph lines are run. Complaints were general all along the lines of the Western Union from Denver to Buffalo. It caused the telegraph companies considerable trouble, as this fog materially reduced their facilities for properly handling the immense volume of press matter incidental to the opening days of Congress and the President's message, etc.

Superintendent Dickey, of the Western Union, says that in his territory alone, which extends from Salt Lake City to the Missouri river, down into Texas, and includes the western portions of the States of Oregon and Washington, the company owns 80,000 miles of single wire strung on 12,000 poles.

The Incandescent Lamp Case.

FULL TEXT OF THE OPINION OF THE UNITED STATES CIRCUIT COURT OF APPEALS IN THE CASE OF THE EDISON ELECTRIC LIGHT COMPANY AND EDISON GENERAL ELECTRIC COMPANY AGAINST THE SAWYER-MAN ELECTRIC COMPANY, FILED DEC. 15, 1892.

Judges Wallace, Lacombe and Shipman, sitting in the United States Circuit Court of Appeals, handed down an important decision on December 15 in the case where the Edison Electric Light Company and the Edison General Electric Company were appellees, and the Sawyer-Man Company was appellant. The full text of the decision follows:

This is an appeal from an order of the Circuit Court granting an injunction *pendente lite* restraining the defendant from making, using, or vending the incandescent electric lamps of the patent granted to Thomas A. Edison, January 27, 1880, No. 223,898, of which the complainants are the owners. The order was granted *pro forma*, in the view that a final disposition of the questions involved might be promptly made by the decision of this court.

The validity of the patent and the infringement of its second claim by such lamps as the defendant makes, were adjudged by the Circuit Court for the Southern District of New York, July 14, 1891, in a decree at final hearing. That suit was brought against the United States Electric Lighting Company, and was defended by the Westinghouse Electric Company, a corporation which since October 10, 1888, has been the owner of the business carried on in the name of the present defendant. The business of the defendant consists exclusively in the manufacture of the infringing lamps. The decree of the Circuit Court adjudging the validity of the second claim of the patent, and its infringement by lamps such as are made by the defendant, was upon an appeal affirmed by this court October 4, 1892. That decree among other things awarded the complainants a perpetual injunction. The present suit was brought subsequently to that affirmance.

It is apparent that the order for the present injunction is in effect one to extend the terms of an injunction already granted in a suit determined by the court of last resort between the same parties, or their privies, so as to include a new infringement. For an understanding of the grounds upon which the defendant contends the injunction ought not to have been granted, the following narrative is necessary:

For several years subsequent to 1880, the Edison Company and the United States Electric Lighting Company were the only manufacturers of incandescent lighting apparatus in this country doing any considerable business. The United States Electric Lighting Company began manufacturing incandescent lighting apparatus, including the lamps which have been held to be an infringement of the Edison patent, in the summer of 1880, and continued in such business until a recent period. In May, 1885, a suit was brought against it upon the present patent. Another corporation, Consolidated Electric Lighting Company, was organized in September, 1882, and began the manufacture of incandescent lighting apparatus. This company was the owner of and operated under what are known as the Sawyer-Man patents for electric lighting apparatus; and under these patents it assumed that it had the exclusive right to make and sell the lamp claimed in the patent in suit. In May, 1885, suit was brought against it by the Edison Electric Light Company, upon the patent in suit, and about the same time it brought suit against the Edison Company for infringement of its own patent. In 1883, a corporation known as the Thomson-Houston Company, began the manufacture and sale of electric apparatus for lighting and power. As the result of negotiations between the Consolidated Electric Lighting Company and the Thomson-Houston Company, the Sawyer-Man Company, the present defendant, was organized in September, 1886. Nine tenths of its stock was owned by the Thomson Houston Company. It received from the Consolidated Company a license to manufacture lamps under the Sawyer-Man patents, and thereupon began the business of manufacturing the infringing lamp, and has continued in this business to the present time. In August, 1887, all the stock of the defendant, including that owned by the Thomson-Houston Company, was sold to the Consolidated Company for $120,000 in bonds, and the same amount at par of its stock. In December, 1888, the Thomson-Houston Company sold its stock in the Consolidated Company to the Westinghouse Electric Company. At the same time, by an agreement between the Consolidated Company and the Westinghouse Company, the fulfillment of which on the part of the Consolidated Company was guaranteed by the Westinghouse Company, the Thomson-Houston Company was licensed under the patents of the Consolidated Company to make incandescent lamps for export and use with generating apparatus of its own manufacture in this country; and the Westinghouse Company was prohibited from selling incandescent lamps for use with the Thomson-Houston generating apparatus for a period which might, at the option of the Thomson-Houston Company, extend to 1902. This agreement recognized the fact that the Thomson-Houston Company could, during the continuance of the agreement, make and sell lamps not covered by the Consolidated Company's patent; and in the event of such manufacture and sale, the latter company was released from its obligation not to sell lamps for use in connection with the Thomson-Houston generating apparatus. Pending the suit against the United States Electric Light Company, the Westinghouse Company succeeded to the business of the United States Company, the Consolidated Company and the defendant; and since September, 1888, the defendant has been the manufacturer of lamps for the Westinghouse system. Each of the various companies engaged in the manufacture and sale of electric lighting apparatus has, as a rule, manufactured all the different pieces of apparatus which are necessary for making up a complete "plant," the different parts being constructed with reference to use with each other, and not so as to be adapted for use in the systems of apparatus made by other manufacturers. For the purpose of public lighting from central stations, local companies, known as illuminating companies, have been organized in various cities and towns, which have purchased plants from one or the other of the manufacturing companies and the central stations of such illuminating companies have, as a rule, been equipped wholly with the electrical apparatus made by some one manufacturing company. In many cities and towns there are competing illuminating companies using the system of different manufacturers, some being equipped with the Edison system, some with the Westinghouse system and some with the Thomson-Houston system.

The United States Company has installed about 1,500 plants, with a lamp capacity of about 350,000 lamps. About 300 of these plants were installed before the suit upon the patent was brought against it. The Consolidated company also installed a large number of plants. After the Westinghouse Company succeeded to the business of the United States Company and the Consolidated Company, it also installed a large number of plants. It is said that the aggregate lamp capacity of the incandescent lighting plants installed with generating apparatus supplied by the Westinghouse Company at the present time represents a capital of about 25 millions of dollars, and a lamp capacity of over 1,300,000 lamps. The lamps themselves represent but a small part of the cost of the plants, the greater part being represented by the electric apparatus supplied by the Westinghouse Company and its predecessors; but the lamps are essential for the continued operation of the plants. Unless the lamps can be replaced as they are worn out, and can be procured when needed, these plants will be crippled and the greater part of the investment in them will be lost. The central station plants supply lights to consumers as gas companies supply gas; and if their operation should be stopped great inconvenience to the public would ensue. The various companies give employment to a large number of men who might be thrown out of employment if the lamps could not be obtained.

In 1889 the Edison General Electric Company was organized for the purpose of combining the Edison Electric Light Company with various other corporations engaged in the manufacture and sale of electric apparatus, the organization of the subordinate corporations being retained. Prior to April, 1892, the Thomson-Houston Company had acquired the stocks of various other companies engaged in the business of manufacturing and selling electrical apparatus, and these companies were carrying on the business in combination with the Thomson-Houston Company and under its control. In April, 1892, these two combinations, the Edison General Electric Company and the Thomson-Houston Electric Company, included substantially all the companies which had theretofore been competing in this kind of business, excepting the Westinghouse Company; and in that month the General Electric Company was organized for the purpose of combining these two combinations in one which should include all the concerns in this country, except the Westinghouse Company, which formerly were competing in the business of making and selling electric light and power apparatus; but the separate organization of the constituent companies was still retained.

The defendant insists that the preliminary injunction should not have been granted because: (1) owing to the laches of the owners of the patent in asserting their claims and enforcing them, a large capital has been invested in the manufacture and sale, not only of the lamps, but also in electric lighting apparatus, which will be greatly depreciated in value unless the lamps can be used with it, and that an injunction will cripple and perhaps ruin the local illuminating companies who have invested in the plants of the Westinghouse companies if they are prevented from using the lamp of the patent, and thereby subject to great inconvenience those whom these plants furnish with light, and displace a large number of persons who are employed in operating the plants; (2) because the complainants and the other corporations with whom the complainants are associated, the competitors of the Westinghouse Company in the business of making and supplying electric power and lighting, have entered into an unlawful combination to suffe competition in that business, and an injunction will be used unconscionably to further the objects of the combination; and (3) because by reason of the affiliation of the Thomson-Houston Company with that combination, and the prior dealings of that company with the defendant, the Consolidated Company, and the Westinghouse Company, an equitable estoppel has arisen by force of which the complainants, as parties to the combination, ought not to be permitted to have an injunction. The question whether there has been any laches in asserting the patent was considered by the Circuit Court of Appeals upon the appeal from the decree of the Circuit Court, and that court declared that no case was shown to authorize the refusal of an injunction on any theory of laches or equitable estoppel by reason of undue delay in bringing suit, or acquiescence in known infringement. If the owners of the patent proceeded with due diligence as respects the United States Lighting Company, no other infringers of the patent can be heard to complain with reason that suit was not brought against them upon the patent previous to the adjudication of its validity in the Circuit Court. It is a matter of notoriety that that litigation was a very expensive and arduous one; and its progress must have been familiar to all those who were extensively interested in having the patent defeated. As regards the present defendant, there are no new facts of importance bearing upon the question of laches to distinguish the case from that shown in the former suit. We see no reason for changing the opinion expressed by this court in the former case, and do not deem it necessary, because the same defense has again been urged upon substantially the same state of facts, to add anything to that opinion.

Every one of the manufacturing corporations, the competitors of the Edison companies, commenced their operations with a knowledge of the existence of the patent in suit. They were controlled by business men of intelligence and experience. Their promoters and managers may have believed, and probably did, that the patent could not be successfully maintained. But they entered upon the business with an understanding of its risks, and of the consequences which would befall them as infringers, if the patent should be sustained. None of them can now be justly heard to say that an injunction, which is essential, if not indispensable, to the protection of the owners of the patent and their licensees, ought not to be granted because of the great pecuniary loss which may result. If, in consequence of being deprived of the use of the lamps, their investments in other electric apparatus will be greatly depreciated, they must take the consequences.

The users, who have supplied themselves with electric lighting plants from the infringers, which required for their operation lamps of the patent, are, of course, infringers. But those who did so before the decision of the Circuit Court sustaining the patent, and at a time when judicial decisions in foreign countries interpreting the patent were in conflict, and who are now willing to accept their lamps from the complainants upon reasonable terms, have much stronger equities than the manufacturing infringers. These equities the court will not disregard; but what would be reasonable terms, if an application were made to the court on behalf of these users, is a question which can only be determined in each case upon its particular circumstances.

As to those users, however, who have acquired these plants subsequent to the decision of the Circuit Court, if they are deprived of the use of the lamps, and, as a consequence, the value of their plants may be greatly impaired, they must accept the result as a consequence of their own imprudence.

We are not disposed to investigate upon the present case the character of the combination which has been formed under the name of the General Electric Company. Whether that combination is intended to fetter competition, and is illegal as one in restraint of trade, is a question which we should not undertake to decide upon the evidence before us and in a suit to which it is not a party. The present complainants are entitled by the patent laws to a monopoly for the term of the patent, of the manufacture and sale of the lamps made under it; the right to this monopoly is the very foundation of the patent system. They do not lose that right merely because they may have joined in a combination with others, holding other patents securing similar monopolies, which combination may, when judicially examined in a proper forum, be held to be unlawful. We do not feel justified in assuming upon the facts before us in the present suit that the use which the complainants propose to make of the injunction, an injunction which seems necessary to secure their monopoly and make their patent fruitful, will be such as to promote any other monopoly. When it shall be made to appear that some one, to whom in fairness and good conscience these complainants should sell their lamps, has been arbitrarily refused them, save upon oppressive and unreasonable terms, it will be time to consider whether the complainants should be allowed to continue in possession of the injunction.

The alleged estoppel seems to be farfetched and shadowy. The history which has been given shows that before the Sawyer-Man Company was organized, litigation upon the patent in suit and upon the Sawyer-Man patents had commenced; that in 1887 the stock in the Sawyer-Man Company owned by the Thomson-Houston Company was sold to the Consolidated Company, a party to the suits; and that subsequently, in 1888, the Westinghouse Company, an actual party to the litigation, bought that portion of the stock from the Consolidated Company which had been owned by the Thomson-Houston Company. The estoppel lacks the elements which ordinarily create an estoppel in *pais*, namely, an injury or a harm to one person resulting from a reliance upon the acts, conduct or declarations of another, in which there was an element of bad faith or willful neglect of duty. The history of the connection of the Thomson-Houston Company from 1886 to 1888 with the Consolidated Company, and with the Sawyer-Man Company, the defendant, shows that all these companies knew of the existence of the litigations in which the life of the present patent and of the Sawyer-Man patent was at stake. There can be no charge of concealment or constructive fraud. When the sale and the agreement of 1888 were made there was no implied obligation upon the Thomson-Houston Company to remain in alliance with the Westinghouse system. The contingency that it might enter upon the manufacture of competing lamps was contemplated. Its union with the Edison interests has neither hastened nor facilitated the application for the present injunction. We perceive no adequate reason from the facts why the complainants should not obtain the ordinary results which attend a complainant's success in a suit in equity for the infringement of a patent.

The injunction order appealed from should be modified so as to cover only lamps made in infringement of the second claim of the patent, the other claims not having been infringed according to the adjudication of the Circuit Court or of this Court. It should also contain a provision reserving the right to the defendant to move hereafter for the vacation, suspension or modification of the injunction upon proof of specific instances of refusal on the part of the complainants, or either of them, to supply the lamps of the patent upon terms reasonable under the circumstances of the particular case, to the owners of electric lighting plants which were installed before the rendition of the interlocutory decree of the Circuit Court sustaining the validity of the patent.

Kerr & Curtis were solicitors for appellant; Edmund Wetmore, Elihu Root and Leonard E. Curtis, counsel for appellant; Dyer & Seely, solicitors for appellees; Clarence A. Seward, Grosvenor P. Lowry and Richard N. Dyer, counsel for appellees.

At the last meeting of the Western Union directors, the regular dividend for the quarter was declared. The quarterly statement made a very wholesome showing, and indicates that the company's net earnings were equal to $1,800,000, the largest amount for any quarter on record. Perhaps in March next a resolution will be offered by the Drexel-Morgan interests to increase the rate of dividend to a six per cent. basis, because it is known that the Western Union Company could pay this amount and still have a very handsome surplus.

Statistics in London show that in that city the consumption of gas is steadily increasing, notwithstanding the more general adoption of electric light.

Sir John Pender and Jay Gould.

In an interesting history of Jay Gould, published in the New York *Recorder*, the writer relates the following interviews which he had with the cable kings of the old and the new world:

Away back in those early "Eighties," John Pender, M. P. at that time for some place in Scotland, arrived in New York. He was then, as I believe he is now, the "cable king" of the British Empire. In addition, he is Sir John Pender, with the decoration of the Star of India. I was asked by the editor of a weekly journal to write a sketch of him, and a meeting was arranged for me in the offices of the cable company Mr. Pender controlled. They were on Broad street, just around the corner from Wall. My opinion of Mr. Pender is of no value. That he is a great, sagacious business man, financier and cable builder, all the world of capital and electric invention knows. What he said is of more consequence than any estimate I may put into type. In this country Sir John Pender has never obtained the credit to which he is justly entitled for his share in the laying of the first Atlantic cables. On that subject this is the substance of what he said: "Mr. Cyrus W. Field is a dear old friend of mine. I have had a delightful time with him at his farm up the Hudson, and we recalled old memories of our cable struggles so many years ago. I was in with him at the start, and I lost heavily as he lost by the failure of the first attempt to bring the two great nations into instant communication. I well remember," said Mr. Pender, "the night he and I walked from my home to the House of Commons, when he came to London to raise capital to make the second attempt at electrically connecting the two continents. He did not have a great deal of capital behind him, but he was a very gold mine of enthusiasm and daring and I promised to go with him again to the extent of £40,000, or, as you here count, $200,000."

There was some talk in financial and other circles at the time of Mr. Pender going into the Western Union directory, and I believe he did go in. Mr. Pender had been away out on the plains, and, the special car in which he traveled having been hauled up at a "siding," the telegraph office of the Western Union Company was entered to get the news. "I was then informed," said Mr. Pender, "of the great victory of our troops in Egypt under Gen. Wolseley. I got news of the success, taking American time as the standard, ahead of the hour when the battle had been fought, and I wired Gen. Wolseley my congratulations to Egypt from the midst of the American wilderness. The fact," said Mr. Pender, "that through human agency, that feat was possible of accomplishment, that in my case it had been accomplished, made a deeper impression upon my mind than I can describe to you. It was a miracle of human progress."

The incident naturally suggested the name of Mr. Gould, and to Mr. Pender I put the question, "What is your estimate of Mr. Gould?" The papers had told me that they had met.

"Mr. Gould," said Mr. Pender, "is the ablest, the most sagacious, the most far-seeing man I have ever met."

Ten minutes after Mr. Pender had spoken these words I saw Mr. Gould walking down Broadway, along by Trinity church. Crossing over from the head of Wall street we met near the main entrance of the building. He stopped and I opened the conversation in these words: "Mr. Gould, a few minutes ago I was with the cable king of the old world, and now I meet the telegraph king of the new one."

"You mean Mr. Pender," he answered with the faintest perceptible smile.

"Yes," I replied, "and in the course of an hour's chat with him he spoke about you."

Mr. Gould became at once interested, and said: "Well, what did he say?" I repeated the words above quoted. He looked in at the tomb of Lawrence of "never give up the ship" fame just inside the church railings. Two o'clock in the afternoon Broadway was thronged. Looking up suddenly, he saw that 15 or 20 people had stopped to look at him. His pallid face flushed a little, and he said: "Will you walk down to the office with me?" It was only a few steps away. I then told him about the Wolseley incident, and what Mr. Pender had said of Western Union, which seemed to gratify him very much. That conversation ended with his offer of a position to me on the *World*, which, after thinking it over, I declined.

I might write much more about Mr. Gould, but space calls a halt. In all my newspaper intercourse with him he never asked me to print a word in his favor, and he never misled me on a point of news.

Professor Bell Wants More Time.

The American Bell Telephone Company and Alexander G. Bell wish until November 4, 1893, to introduce further testimony before the examiners in the suit of the United States against them. The United States objects to a further extension, therefore, there was a hearing before Justice Nelson in the U. S. Circuit Court on a motion of the defendants for further time. The United States finished its testimony on January 11, 1892. During that period more than 100 witnesses were examined. The defendants began their testimony on January 25, 1892, and had until October 1, last, to finish it. One hundred and two witnesses were examined in that time and the evidence is not finished. It took 53 days to put in Professor Bell's testimony, and it covered 378 pages on direct and 455 on cross-examination. Prof. Daniel Drawbaugh's testimony alone consumed 123 days and took up 368 pages on the direct and 1491 pages on the cross-examination. The defendants state that they have not replied to the evidence of Professor Drawbaugh, and they desire further time within which to do so.

The United States opposes the motion for more time, because, as contended, the examination of the defendant's witnesses has been unnecessarily protracted, and some of the Bell patents expire within a very short time, and the case should not be pending after the patents have expired.

ELECTRIC RAILWAY AND POWER NOTES.

The power house of the Lynn and Boston Railway in Chelsea is almost finished.

The electric railway between Wilkesbarre and Ashley, Pa., is now open for traffic.

Electric railroad between Newport News and Hampton will be in operation this week.

A scheme is on foot to connect the towns of Sanford and Springvale, Me., by an electric road.

Japan will soon have two roads to be operated by the trolley system, and the cars will be heated by electricity.

The board of control of Cleveland, O., request an estimate of the cost of an electric belt line to encircle the city.

The Denver Tramway Company will soon construct an electric railway through the principal thoroughfare of the city.

The city officials of Danbury, Conn., have for some time been discussing the change from horse-power to electricity in running the street railroad.

The electric railway has penetrated even the fastnesses of the Tyrolese mountains. A road 27 miles long is being projected between Riva and Pinzola.

Work was commenced last week in connecting the tracks of the Haverhill, Merrimac and Amesbury road at Monument square in Haverhill, Mass.

The people of Salem and Pelham, Mass., have given public notice that they will apply for a charter for an electric road at the sitting of the General Court in January.

The Rockville Gas Light Company announced their intentions of applying for a charter for an electric street car line to be run between Rockville, Conn., and Ellington.

The Watertown & Waltham electric road is rapidly nearing completion, the road being laid nearly to Waltham. It will be spring, however, before the final work is finished.

R. R. Waddell, proprietor of the Hamilton and Milton Toll Road, of Toronto, Ont., is going to apply for a charter for an electric railway from Hamilton to Schaw station on the C. P. R.

The Easton Transit Company, of Easton, Pa., have completed a line between Easton and South Easton. Ten cars are at present in use, and if the traffic calls for more they will be ordered immediately.

The Rockland, Me., city aldermen have voted to permit the Rockland, Thomaston & Camden Electric Railroad to extend its lines, provided the company pays one-half the expense of paving the streets occupied by its lines.

The further hearing in the case of the Cambridge Storage Battery Electric Street Railway before the Railroad Commissioners of Boston, in which the petitioners ask for the approval of the locations granted them by the Board of Aldermen, was postponed until Dec. 15.

The New Britain Tramway Company, of Hartford, Conn., have given notice that they will apply to the next legislature to change the name of the company to the Central Railway and Electric Company and to extend their lines through nearly all of the principal streets.

The managers of the Herkimer and Mohawk and the Mohawk and Ilion Street Railroads intend to equip the same with electricity. It is probable that by early spring the cars on both roads will be run by electricity, and it is expected that the plants will be located in Mohawk.

The contract for constructing the Warren-Niles, O., street railway was ratified by the directors under the new organization, and active work in the way of grading will be commenced this week. The site for the power house has not yet been selected, but the plans and specifications for the building have been drawn up, and the contract will be closed within a few days.

An electric road is soon to be run from Mayfield and Palo Alto, Cal., through the University grounds. Senator Stanford has refused permission to any and all stock companies to enter his grounds in this manner, but has given his assurance that he will meet any road at the entrance of the grounds and run a branch road from it to the quadrangle. A Mountain View syndicate and another from Mayfield are competing for the franchise.

At a meeting of the railroad commissioners of Salem, Mass., last week, Mr. Knight, engineer of the Thomson-Houston Company, stated that in a very short time, the question "Can the rumbling noise of the trolley cars be lessened?" will be changed to "Do the cars make sufficient noise?" These are very pertinent questions, for the faulty mechanical arrangement of the gearing on some cars is the cause of considerable annoyance during the still hours of the night.

Three more electric railways are expected to be in operation in St. Louis about the first of next March. With the completion of the work now being done on the Northern Central, the Cass Avenue and the Union Railway lines, that of changing the motor power of the three properties to electricity, the residents of St. Louis claim that they will have the best equipped and most extensive street car service of any city in the world. The central power station, at Spring and Prairie avenues, with the mammoth boilers, the engines and the 50 dynamos, is fast nearing completion.

THE HENRION DYNAMO.

Salamander Wire Tests.

We have received from the Washburn & Moen Manufacturing Company, Worcester, Mass., a sample board showing a comparative test between one Salamander wire, made by the above company, and three other wires. The four lengths of wire were spliced together and then fastened to the board with double pointed tacks. A knot was tied in the Salamander wire. Then a current of 150 amperes was passed through all four wires for two minutes. The insulation of three of the samples broke down and burned up, while the Salamander withstood the test and, to all appearances, was unaffected by it.

The Washburn & Moen Manufacturing Company have had tests made by the Massachusetts Electrical Engineering Company, of Boston, and by foreign experts, which show for Salamander wire a water resistance of 5,000 megohms and over, after being submerged in salt water from six to ten days.

Salamander wire is made in two grades, A and B. Grade A, is made with Para rubber insulation, and is said to be absolutely fire and water-proof. It is especially designed for inside wiring in damp places, and wherever the highest insulation is desired. Grade B, is moisture-proof and equal to grade A in fire-proof qualities, but is sold at a less price. It is made for inside wiring in dry places.

The Henrion Dynamo.

The machine we illustrate is of French design and manufacture, being built by M. Fabius Henrion, of Nancy. The armature is of the disk type and the three pairs of parallel circuits are coupled together, so that only two pairs of brushes are required. Four or six may, of course, also be used. The frame of the machine is designed so that the top part can be lifted off, allowing the armature to be removed with ease, if such a necessity should arise. One of the most interesting points about this machine is the system of lubrication employed. The bearings are kept well oiled by the ring method; the rings, however, are made with numerous perforations, so that they pick up more oil than the usual smooth form. The bearings also contain strainers, so that the machine not only carries its own self-acting lubricator, but also an oil filter for each bearing. These machines are wound for any desired output, and are frequently made to compound up to allow for the loss in the leads.—*London Industries.*

A Compact Marine Installation.

The special advantages of the combination generating set, comprising dynamo and engine compactly erected on one base, described in the ELECTRICAL REVIEW for October 22, 1892, are strikingly displayed in the plant which we illustrate herewith.

This plant is the first electrical plant ever placed upon a steamship of the whaleback type, and was installed on the "Pillsbury," when building at West Superior, Wisconsin. Considerations of space entered largely into the question of this installation; and, a small room, eight feet square, was all that could be spared. This precluded the employment of a belt connected plant, and a generating set of the General Electric Company's type was therefore adopted.

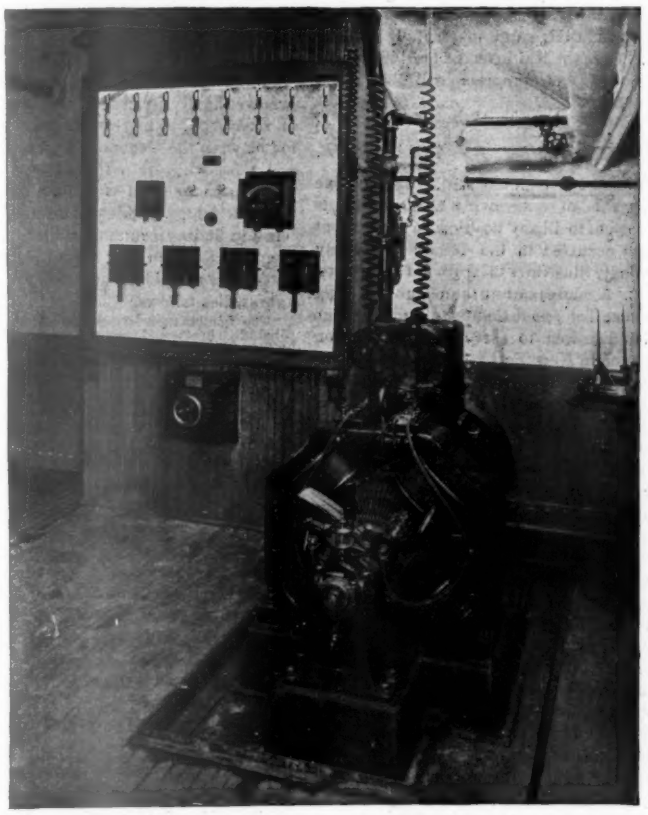

FIG. 1.—ELECTRIC LIGHT PLANT ON WHALEBACK STEAMSHIP "PILLSBURY."

The dynamo, of the four pole type, is of 150 lights capacity, and is directly coupled to a 15 horse-power engine, both having a common bed plate. Behind the engine and attached to the wall is the white marble incombustible switchboard. The dynamo room is located in the after portion of the vessel on the first lower deck.

The vessel is wired in the usual manner for 150 lights, the best grade of wire for marine purposes being employed.

This installation, and that on the sister whaleback, the "Washburn," were effected by the Isolated Lighting Department of the Northwest General Electric Company.

TELEGRAPH NEWS.

The pay of all dispatchers on the Big Four has been increased $10 per month.

Many of the telegraph operators on the Rock Island road went out on strike on December 9 at Des Moines, Iowa, and Kansas City, Mo. New operators have been obtained for important points by the officials, but at all smaller stations the service is cut off.

The daily papers of the country are unanimous in expressions of their indebtedness to the Western Union Telegraph Company for the copy of the President's message, which the company furnished free to the daily press of the country applying for it. Some idea of the magnitude of this undertaking may be had when it is known that the message contained 18,000 words. The message was delivered to the Western Union Company under pledges that it was not to be sent out in time for the morning papers, to prevent its premature publication.

Should the Neutral Wire Be Insulated?

The last meeting of the Elektrotechnische Verein, Berlin, October 25, 1892, was one of unusual interest, as the reasons for and against insulating the neutral wire in lighting systems were fully discussed. Mr. Grawinkel, the interpreter of the German Telegraph and Telephone Administration, advocated strongly the use of an insulated neutral wire to prevent serious accidents, "as it is indisputable that a naked neutral conductor increases the possibility of danger and facilitates the occurrence of accidents. And this remark applies, with still greater force, to the naked aerial power conductor."

Mr. Grawinkel's opinion, which is based upon a series of experiments recently made in Berlin with the neutral wire insulated and uninsulated, was violently attacked by several members of the association. Among others, by Director Jordan, Dr. Nordmann, von Dolivo-Dobrowolski and Chief Engineer Wilking.

Without entering into the details of the more or less spirited rejoinders, we may state that these gentlemen attempted to disprove the danger arising from a naked neutral wire, either overhead or underground. The most interesting answer was given by Mr. Agthe, which we translate as reported in the *Elektrotechnischer Zeitschrift*:

I desire to review the experiments with a naked neutral wire made jointly by the Berlin Electrical Works and the German Postal Administration.

It seems to me that Mr. Grawinkel has based his conclusions upon a wrong assumption *a priori*, for it will be remembered he stated that if the entire network were insulated a naked neutral wire would be more dangerous than an insulated conductor. Theoretically this may be true; practically the matter is otherwise. With the rapid growth of our light installation it became necessary to tolerate small defects developing at subscribers' stations, simply because they could not be detected or removed immediately. In fact it is impossible to keep a network like that used in the Berlin lighting installation, covering 3,000 kilometers of conductors, absolutely insulated and to guard it against grounds. Experience has shown that such grounds always appear at the minus or negative pole and this fact, at the introduction of the Edison three wire system, led us to consider the propriety to use the negative conductor of the system, which cannot be kept free from grounds, as the neutral wire. This plan was duly adopted, for it was rightly urged that by using the negative conductor as the neutral wire such defects or accidents as might happen would be far less dangerous.

I will now discribe our experiments. First we inserted fuses between the ground and conductor under test, while at the same time (regardless whether or not the neutral conductor was grounded) we caused a careful observation of the effect of such test upon the neighboring telephone offices.

The result was as follows:

GROUND TESTS.

Place of Test.	Pole.	Number of dropped annunciators, the electric light system being arranged.	
		As ordinary.	Neutral conductor grounded at several points.
Station, Mauerstrasse	+	368	1
" "	—	343	—
" Schiffbauerdamm.	+	815	51
"	—	727	32
Central Sta., No. III.	+	954	113
" "	—	982	44
" " V.	+	1875	1649
	—	1735	1684

The last two tests at stations No. 3 and 5 prove that a naked wire caused many more annunciator shutters to drop than in the former experiments, but this fact is explained by the massing of telephone conductors at these stations. The above figures demonstrate the fact that, generally speaking, a naked neutral wire affects the telephone conductors less than an insulated conductor.

The tests made by short circuiting the electric light conductors produced but little trouble at the telephone offices.

TEST WITH SHORT CIRCUITS.

Place of Test.	Pole.	Number of annunciators dropped, the electric light system being arranged.	
		As ordinary.	Neutral wire earthed at several points.
Station, Mauerstrasse.	+ 0	—	12
	— 0	—	2
" Schiffbauerdamm.	+ 0	8	3
	— 0	—	41
	+ 0	—	89
	— 0	—	1
	+ 0	—	84
	— 0	—	32
Central Sta., No. III.	+ 0	—	—
" " V.	+ 0	3	1495
	— 0	—	1450

Taking into consideration that these tests were conducted either in the central telephone stations or in their immediate neighborhood, *i. e.*, at points where the largest number of telephone conductors are to be found, and considering further that the neutral wire was not grounded throughout its length, but only at certain points, and keeping in mind the fact that short circuits happen much less frequently than grounds, it appears that the above experimental results are in favor of employing a naked neutral conductor. In consequence of these tests the Berlin Electrical Works have sent a petition to the German Postal Administration for permission to ground the neutral wire in one of the largest sections of the city. I conclude by stating that the use of the uninsulated neutral wire was prohibited by a city ordinance upon instruction from the Postal Administration.

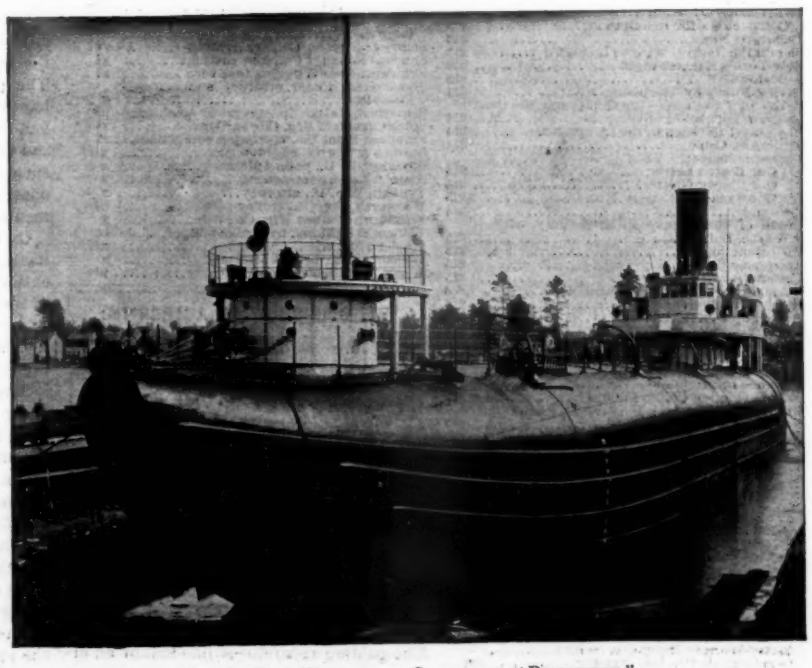

FIG. 2.—THE WHALEBACK STEAMSHIP "PILLSBURY."

New York's Electric Lights.

The annual meeting between the New York Gas Commission and the electric lighting companies took place at the Mayor's office on December 15. The United States Illuminating Company had bid for 77 lamps at 50 cents, the Manhattan for a like number at the same price, the Thomson-Houston Company for 45, and the Brush Company for 42. Representatives of all these companies stated that there were new lamps in localities where there is no demand for electric lights for commercial purposes, and that they could not afford to supply the lamps at the usual rate of 40 cents a night and pay the subway rentals.

Commissioner Gilroy declared that there was an evident attempt on the part of the companies to force the city to their terms, although they held valuable franchises from the city. Comptroller Myers said that the city will have to seek relief against the combination in the legislature.

The 50 cent bids were rejected, which leaves these streets unlighted: Lexington avenue, between Thirty-fourth and Fifty-ninth streets; Thirty-sixth street, between Madison and Fifth avenues; Twenty-fifth street, between Broadway and Sixth avenue, and Twenty sixth street, from Fifth to Sixth avenues. The bids of the Thomson-Houston and the Brush companies were laid over.

Commissioner Gilroy announced that as Mayor he will not grant permission to lighting companies for a year to open streets where bids have been rejected. Secretary McCormick announced that residents in Fifth avenue want more light than they get at present from the Edison double lamps at the street corners. Mr. Gilroy said they couldn't have them and Mayor Grant added, "Unless they pay for them."

There will be 1,000 more electric street lamps this year than last, and a consequent diminution of the number of gas lamps by 3,000. The bids of the electric light companies which corresponded with prices paid for 1892, were accepted.

A Boston Ball.

The employés of the West End Street Railway Company, Boston, connected with the central power station, are to hold their second annual reception and ball in Oriental hall, Tuesday evening, January 24, 1893.

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CONTENTS.

	PAGE.
Views, News and Interviews	209
The Telephone in Sweden	209
World's Fair News	210
The Incandescent Lamp Case	211
Sir John Pender and Jay Gould	212
Professor Bell Wants More Time	212
Salamander Wire Tests	212
Electric Railway and Power Notes	212
The Henrion Dynamo	213
A Compact Marine Installation	213
Telegraph News	213
Should the Neutral Wire be Insulated	213
New York's Electric Lights	213
A Boston Ball	213
Saving Money by Telephone	214
A Tale of Two Cities—The Quick and the Dead—New York and Philadelphia	214
The Latest Decision in the Lamp Case	214
Trolley *vs.* Cable	214
Correspondence:	
Our Boston Letter	215
Our Chicago Letter	215
Our Canadian Letter	215
Personal	215
Death of Marmaduke M. M. Slattery, of Fort Wayne, Ind.	215
No Injunction	215
Telephone Chat	215
Letters from a Laboratory	215
Variable Speed Power Transmission	216
Electrical Advertisements	216
An Epitaph	216
The Pruynway	216
Electricity in the Art of War	218
Buffalo Electrical Society	218
An Interesting Meeting	218
Advance Information	219
Barnes Friction Clutch Pulleys	219
The Buffalo General Electric Company Sustains a Loss by Fire	219
Kindred Interests	220
Queen & Company's Testing Sets	220
Literary	220

INDEX OF ADVERTISERS.

COVER PAGES.

	PAGE.
American Electrical Works, insulated wire	i
Ansonia Brass & Copper Co., wire	xvi
Armington & Sims, engines	xvi
Babcock & Wilcox Co., boilers	xvi
Beacon Vacuum Pump Co., inc. lamps	i
Brush Electric Co., apparatus	xv
Church & Sleight, tools and supplies	xiv
Crocker-Wheeler Motor Co., motors	i
Dixon Crucible Co., belt dressing	xvi
Eastern Electric Cable Co., insulated wire	xvi
Eddy Electric Mfg. Co., motors	i
Germania Electric Co., shade holders, etc.	xvi
Hampson & Co., E. P., engines	xvi
Harrisburg Foundry & Machine Works, steam engines	i
Jewell Belting Co., belts	xvi
Moore, Alfred F., wire	xvi
Noye Mfg. Co., John T., engines	xvi
Okonite Co., insulated wire	i a xvi
Otis Bros. & Co., elevators	xvi
Paine & Ladd, patent attorneys	i
Perkins Electric Lamp Co., inc. lamps	i
Reed & Co., F. E., lathes	i
Simplex Electrical Co., insulated wire	i
Waldo & Stout, aluminum alloys	i
Waterhouse, Gamble & Co., arc lamps	i
Westinghouse Electric & Mfg. Co., electric lighting and electric railway generators	ii a xv
Weston Engine Co., engines	i
Wilmot & Hobbs Mfg. Co., bell gongs	xvi

INSIDE PAGES.

Allis & Co., Edward P., engines	xi
American Bell Telephone Co.	xiii
American Engine Co., engines	x
Baker & Co., platinum	220
Ball Engine Co., engines	x
Ball & Wood Co., steam engines	ix
Barnes Co., W. F. & John, tools	xi
Barrett, John A., electrical engineer	x
Bernstein Electric Co., electric motors	viii
Bickford & Francis Belting Co., belts	ix
Bishop Gutta Percha Co., insulated wire	x
Blaisdell & Co., tools	xi
Boston Gear Works, gears	220
Brill Co., J. G., tramway cars	vi
Buckeye Engine Co., engines	xi
Carpenter Enamel Rheostat Co., rheostats	ix
Central Electric Co., supplies	xiii
Conover Mfg. Co., condensers	xii
Cowles Electric Smelting & Aluminum Co., aluminum	220
Cutter, George, electrical supplies	viii
Davis, Chas. H., electrical engineer	220
Day's Kerite, insulated wire	viii
Detroit Electrical Works, apparatus	viii
Dewey Electric Heating Co., electric heaters	xi
Dunderdale, F. C.	220
Dwight Slate Machine Co., drills	xii
Edson, Jarvis B., recording gauges	v
Electric Construction and Supply Co., arc lamps	iii
Electric Secret Service Co., cut-outs	vi
Electro-Light Engraving Co., engraving	vi
Elektron Mfg. Co., electric motor	viii
Empire China Works, porcelain specialties	iv
Eureka Tempered Copper Co., copper specialties	xiv
Faraday Carbon Co., carbons	iv
Falls Rivet & Machine Co., friction clutches	vi
Fitzgerald, S. G., patent attorney	x
Forest City Electric Works, arc cut-out	220
Fort Wayne Electric Co., electric lighting	v
For Sale—engine	220
Garvin Machine Co., tools	xi
General Electric Co., inc. lamps	vii
Gleason Manufacturing Co., E. P., electrical appliances	xii
Greeley & Co., The E. S., supplies	vi a x
Heinze Electric Co., electrical apparatus	iv
Holman Electrical Co., F., reflector shades	vi
Holmes, Booth & Haydens, insulated wire	xiv
Horn & Co., G. E., electric bells	220
Interior Conduit and Insulation Co., conduits	xi
Johns Mfg. Co., H. W., vulcabeston	iv
Jones & Son, J., electrical supplies	iii
Lake Co., J. H. & D., friction clutch pulleys	220
Leclanche Battery Co., batteries	ix
Lehigh Valley Creosoting Co., creosoted lumber	ix
MacKie Robb	x
Marshall, Wm., condensers	x
Massachusetts Chemical Co., insuliac	iv
Morrison, Geo. H., indicators	xi
National Electric Mfg. Co., electrical machinery	xii
National Pipe Bending Co., water-heater	ix
New England Butt Co., braiding machinery	xiii
New Jersey Lamp & Bronze Works, electric and gas fixtures	ix
New York Belting and Packing Co., rubber belts	iv
Non-Magnetic Watch Co., watches	xiii
Onondaga Dynamo Co., electrical apparatus	iv
Ostrander & Co., W. R., supplies	220
Penn Life Co., insurance	x
Phœnix Glass Co., glass globes	xii
Phosphor Bronze Smelting Co., castings	xiii
Pope Mfg. Co., bicycles	220
Prentiss Tool & Supply Co., tools	220
Queen & Co., electrical instruments	220
Railway Equipment Co., elec. r'y supplies	xiii
Rhode Island Tool Co., tools	xii
Richmond Paper Co. Estate	220
Ries Electric Specialty Co., regulating socket	xiv
Ridlon & Co., Frank, general machinery	220
Robinson & Orr, steel rails	220
Rosenbaum, Wm. A., patent attorney	x
Royce & Marean, electrical apparatus	x
Russell & Co., steam engines	xiv
Sawyer-Man Electric Co., incandescent lamps	iii
Schuyler Electric Co., arc lighting	vi
Sessions Foundry Co., iron castings	xi
Shawmut Fuse Wire Co., fuse wire	xi
Shoemaker, Homer, attorney and counsellor-at-law	x
Siemens & Halske Co., electrical machinery	iii
Solar Carbon & Mfg. Co., carbons	xi
Standard Paint Co., insulating compounds	xi
Stevens & Morris, engravings	xii
Stocking, E. B., patent attorney	x
Swan & Lane, contractors	x
Tyndall, Wm. D., attorney	x
Walworth Mfg. Co., trolley poles	iii
Washburn & Moen Mfg. Co., wire	x
Watson & Stillman, hydraulic presses	ix
Western Electric Co., supplies	xiv
Willson, H. B., patent attorney	x
World Fair Electrical Engineering	xiv

THE OPINION OF AN AUTHORITY:

"The editorials appearing in ELECTRICAL REVIEW have been of untold value to all electrical enterprises."

A. M. YOUNG.

Business throughout the electrical trade is good, and the prospects for the coming year are most encouraging. The demand for apparatus for lighting and power purposes is steady, and for this season of the year exceptionally good.

An electric invalid chair has been invented. The guiding apparatus is like that of an ordinary low seated tricycle, and at one side of the seat is a lever connected with a resistance box for controlling the motor. The motor is wound for a low electromotive force and is of the slow speed design, connected to the driving shaft by a single reduction gearing. The storage batteries are placed under the seat; and at the rate of eight miles an hour are calculated for 50 miles of travel.

A proverb, it is said, is "the wisdom of many combined with the wit of one," and many tales of trials and tribulations in experimenting may be summed up in a few short words. Some noted scientist once declared that "there has been little or no progress in the *science* of electricity, but great progress in the *application* of it." Well said, and it must be noted that advancement in science is the result of discoveries, while improvements and progress in the applications of electricity to the economy of manufactures are the result of inventions often made at a great sacrifice to the inventor whose ultimate objects are benefits to the world at large and incidentally to himself. Give the real inventor his due and the course of true progress will be much smoother.

SAVING MONEY BY TELEPHONE.

Colonel Ingersoll has said, "If any one is capable of outgrowing Chicago, he is competent to fill any position." An incident which occurred in the Windy City lately strikingly illustrates the truth of the above remark. A man came into the office of the Long Distance Telephone Company at the Chicago end and desired to serve an injunction on someone in New York. He stepped to the telephone attendant and informed him that he wished to converse with a man in New York. The attendant politely showed him into the booth and shut the door. When all connections were made the clock outside began to tick off seconds at the rate of three cents per second. (A message would be exceedingly cheap if we could communicate our information and receive it in a few seconds, but we can't.) When the allowed five minutes was up the attendant was surprised to find the door still shut; visions of asphyxiation, suicide, etc., filled his mind, but imagine his relief, when the clock had ticked 2,200 times, to see the occupant come out of the booth and deposit $66 in his hand. The next day the same man returned and talked to the time of 5,933 beats of the pendulum, and for this privilege paid $178. It afterwards leaked out that he had saved $12,000 by the use of the long distance telephone. Who now can have any doubt of the great practical utility of the New York-Chicago line?

A TALE OF TWO CITIES—THE QUICK AND THE DEAD—NEW YORK AND PHILADELPHIA.

The time has at last come when the quiet city of Philadelphia will no longer deserve the appellation of "The Sleeping City." The people of the city of brotherly love have rubbed their eyes and waked up to the fact that in this age of rush and bustle, quick and satisfactory passenger transportation, such as we should have in New York, is one thing needful to municipal improvements.

On December 15, the trolley system made its bow in Philadelphia. Every one was enthusiastic and acted as if the new method of transportation was a toy; crowds gathered to see "the wheels go round," and real estate owners showed their appreciation by notifying their tenants of increases in rent.

Twelve cars were run during the day and every car was crowded to its utmost capacity. It will, however, be a fortnight before the officers will be able to say whether they will need more cars or not. Because, well, because they think the public is fickle and unreliable.

Lemuel Bannister, vice-president of the Westinghouse Electric Company visited the plant and made a minute inspection of the entire route.

The steel rails weigh over 90 pounds to the yard. Between them is a bed of rock covered with thick layers of concrete. From the rails to the curbs, sheet asphaltum and Belgian blocks are used over the entire route, which ensures clean and passable streets at all times.

Let us hope that Philadelphia has started the trolley a-rolling, to be followed by other improvements as beneficial to the public.

THE LATEST DECISION IN THE LAMP CASE.

The decision of the United States Circuit Court of Appeals upon an appeal from its injunction in the incandescent lamp suit against the Westinghouse Electric Company, given in full on another page, moderates to some extent the force of the injunction in requiring the General Electric Company controlling the Edison patent to furnish lamps at reasonable rates to such users as commenced operating electric lighting plants prior to the decision sustaining the patent. The question as to what will be considered reasonable terms the court leaves for consideration in each case in view of its particular circumstances. It would thus seem that this great legal controversy is not even yet finally terminated, as there will, in all likelihood, be a great difference of opinion between the General Electric Company and those who are not licensees of its apparatus, as to what will be a reasonable price for lamps. This will create a new interest in finding a suitable substitute for the lamp described in the second claim of the patent, the meaning of which the court paraphrased as follows:

"The combination of carbon filamentary or thread-like in size and properly carbonized, used as an illuminant in an incandescent electric lamp, with a receiver made entirely of glass and conductors passing through the glass, and from which receiver the air has been exhausted to such an extent that disintegration of the carbon due to the air-working action of surrounding gases, or to any other cause, is so far reduced as to leave the carbon practically stable."

Whether this would cover a carbon filament in a high vacuum formed of a jointed structure such as the Westinghouse Company is now using is not clear. A fine opportunity is afforded for a lamp having a filament of some other material than carbon.

What the full effect of these decisions will be cannot be prognosticated. If, in the new controversies which will probably arise over the price of lamps, the General Electric Company is restricted to a profit measured by those derived in other manufacturing industries, not based on patents, rival manufacturers will still be able to compete in other lighting apparatus than lamps. If the measure of profits be made such that it will be cheaper for local lighting concerns to change their machinery so as to get a favorable license with the General Electric Company, it will practically preclude rival operations in the incandescent lighting field.

As the court has refused to say what shall be considered a fair profit, and has refused to entertain the charge that the General Electric Company is a trust and designed to fetter competition, and therefore illegal and not entitled to relief by injunction, the controversy will be opened afresh in another court. The decision cuts both ways. The court says to the Westinghouse interests, "You must stop making such lamps." To the General Electric Company, "You must sell lamps at a reasonable price to those who began using them before the date of the decision, but we cannot tell you how much profit you can expect; that must be done in another forum."

It looks as if the patent would expire before the row is settled.

TROLLEY VS. CABLE.

One of the most striking examples of the difficulties encountered in the construction of the cable road can now be seen at the junction of Frankfort street with Park Row. Only one or two years ago a series of twenty-four iron pipes, each containing a cable consisting of about 100 double wires, were laid through this street for electric connections with Brooklyn *via* the Bridge. All these pipes are now being cut, as well as the wires, and lead pipes containing wires substituted, and bent to a deeper level so as to give room for the cable road to cross the electric subway there.

Other obstructions are water pipes, gas pipes, steam ducts, sewerage connections and electric subways; the change of the position of all these, the necessary digging up of the street, and replacing it afterward in its original condition, involves an enormous amount of labor, which, of course, has to be borne by the cable road, which increases the cost of its construction enormously, and stands in a very sharp contrast with the cheap, simple and efficient trolley wire system adopted by Brooklyn.

CORRESPONDENCE.

OUR BOSTON LETTER.

Mr. **George A. Beatey**, electrical engineer, of 620 Atlantic avenue, this city, has accepted the Eastern agency for the John Wood Company's engines and boilers, and has already placed several large contracts.

The **Association of Street Railway Superintendents** of the State of Massachusetts had a dinner at the Quincy House last week, at which a number of interesting matters were brought up for discusson.

The **Case** of the Storage Battery Electric Street Railway Company, which has been for some time past before the Board of Railroad Commissioners, has been ended, the Board declining to take any further action in the matter, and referring it directly to the Legislature.

Messrs. R. Fleming & Company, engineers and contractors, have just accepted the New England agency of the Harrisburg Foundry and Machine Works, and have opened an office at 620 Atlantic avenue, this city. They are putting out a remarkably handsome illustrated catalogue of the "Ideal" engines.

The **Brown Electric Company**, of which the well-known and popular Maybin W. Brown is general manager, has just been organized here, and the company are now fitting up their quarters at the junction of Federal and Summer streets, where they will carry on a general electrical supply business.

The **Babcock & Wilcox Company** are fitting up two large plants for the Lynn and Boston Street Railway Company with their boilers, one at Lynn and the other at Chelsea. The main station of the West End road is at present using 6,000 horse-power, and 3,000 additional horse-power is being put in.

The **Railway Equipment Company**, of Chicago, Ill., have just published a handsome new catalogue showing a full line of their specialties in overhead parts for railway equipment. Mr. Charles E. Rowe, the New England agent for the company, reports that they are making great preparations for next year's business, and are now in a better position for handling the trade than ever before, from the fact that they are manufacturing their own goods.

Mr. **Paul H. Evans**, the Mexican representative of the Thomson-Houston Company, is in town for a few days, and reports electrical matters in Mexico, especially the electric light and telephone business, as in a most flourishing condition. While the development is considerably behind that of our own country, the people are still fully alive to the benefits to be obtained, and the various enterprises in this field are meeting with very general encouragement.

The city of Mexico is well supplied with electric lights and telephones, but no long distance service has yet been attempted. Electric traction is still entirely undeveloped, although, outside of Boston, the city of Mexico offers the greatest inducements in this line of any community in the world. In this city the West End Company run in the neighborhood of 700 cars a day, while in the city of Mexico there are over 500 per day, all using horse power.

Long distance transmission of power will soon be given a trial in Guadalagara, a city of 130,000 inhabitants, and an important commercial center. The people want electric lights, and the current, which will be generated by water power, will be transmitted from a point 16 miles distant.

Mr. Evans disclosed the rather interesting fact that while it took $1.52 in Mexican silver money, which is the national currency of the country, to purchase the value of $1 in gold, American money, either silver, greenback or silver certificate, circulated freely at par. H. G. T.

Boston, Dec. 17.

OUR CHICAGO LETTER.

Frank B. Rae, of Detroit, Mich., is in the city this week.

G. M. Brill, of the Brill Car Company, Philadelphia, Pa., is in the city looking after the interests of his company.

George Cutter is perfecting a new waterproof key socket, specially adapted for the severe usage in mines and tunnels.

Albert Scheible read a paper on "Three Point Incandescent Switches" at the last meeting of the Chicago Electrical Association.

Everett Morse, of the Simplex Electric Company, spent a few days in Chicago last week, while on his way back from Montana to Boston.

J. F. Kester has severed his connection with the Kester Arc Lamp and Manufacturing Company, of Ironwood, Mich., and is now engaged in developing a number of new electrical specialties.

Quick Work was done in rebuilding the station of the Des Moines Water Power Company, Des Moines, Iowa, which burnt down a few weeks ago. In ten days a new plant with a capacity of 4,000 incandescent and 400 arc lights was installed and in operation.

The Chicago Electric Club will hold a meeting on Monday evening, December 19, at which time many important matters will be disposed of. The literary programme will consist of the reading and discussion of a paper on "An Ideal Power Station," by Messrs. Field, Cook and Bourne.

Dr. John McKinlock, recently connected with the Central Electric Company, but now following his profession, the practice of medicine, has very successfully handled some complicated cases of eye and ear trouble with the very best results. Dr. McKinlock stepped into a most lucrative practice owing to the wide circle of acquaintances which he possesses.

The Central Electric Company, since taking the agency for the interior conduit, have been placing the same in some of the largest buildings throughout the West, and the results obtained by its use in conjunction with Okonite wire and the improved devices which have been recently developed in connection with the conduit, makes the system most complete and serviceable.

Messrs. Taylor, Goodhue & Ames have secured the exclusive agency for the Diamond transformers made by the Diamond Electric Company, Peoria, Ill. This transformer is made in all sizes from 10 to 1,000 lights, and a large number have been sold recently which are giving the very best satisfaction. Taylor, Goodhue & Ames are getting out a catalogue for the same, which will be ready at an early date.

The Railway Equipment Company, Chicago, report a very large business in the Ahearn electric heaters. Orders for car heaters have been received from Amsterdam, N. Y., Peoria, Ill., Williamsport, Pa., Kokomo, Ind., Great Falls, Mont., Camden, N. J., Jackson, Mich., Albany, N. Y., Lynn, Mass., Burlington, Ia., Fitchburg, Mass., Cairo, Ill., Des Moines, Ia., Allentown, Pa., Rockford, Ill., Cleveland, Ohio, Detroit, Mich., Brooklyn, N. Y., Spokane Falls, Wash., Alexandria, Va., Kansas City, Mo., Quincy, Mass., Salt Lake City, Utah, Chicago, Ill., Natick, Mass., Terre Haute, Ind., Marquette, Mich., Elwood, Pa., Escanaba, Mich., Kankakee, Ill., New Haven, Conn., Galesburg, Ill., Hammond, Ind., and large orders have also been received for the Ahearn electric stoves and other devices. The company state that in its opinion the Ahearn electric heater is the most reliable and satisfactory of any electric heater in the market.

Chicago, Dec. 17. M. J. B.

OUR CANADIAN LETTER.

Aylmer, Quebec.—The Aylmer *Gazette* is advocating the construction of an electric railroad from Ottawa, Ont., to its town.

Montreal, Quebec.—The Royal Electric Company have been awarded the contract to light the city by electricity for the coming ten years.—The St. Henri Light and Power Company will apply to the legislature at its next session to increase the capital stock to $1,000,000 and otherwise to amend its charter. J. A. C.

Montreal, December 17.

PERSONAL.

Mr. C. M. Morse, of the Buffalo Engineering Company, Buffalo, N. Y., was in the city last week attending to his Christmas shopping.

Hon. Chas. Selden, of Baltimore, Md., was in New York last week conferring with that other able electrician and inventor, E. T. Gilliland

Mr. H. E. Webb, representing the Solar Carbon and Manufacturing Company, of Pittsburgh, one of the well known and very successful carbon manufacturing companies of the country, was a New York visitor last week and paid the REVIEW a pleasant call.

Mr. Harlow C. Palmer, treasurer of the Bell Telephone Company, of Buffalo, was a welcome visitor in electrical circles this week. Although young and handsome, Mr. Palmer is one of the pioneers in telephone work, is an all-round athlete, and a gentleman who numbers his friends by the many score.

Lieut. Avery D. Andrews, U. S. A., son-in law of General Schofield, has resigned from the army and commenced the practice of law in New York, at 111 Broadway, the firm being Wells & Andrews. Lieutenant Andrews is a gentleman of education and force, and will, we predict, win a high name in his profession.

Death of Marmaduke M. M. Slattery, of Fort Wayne, Ind.

The sad news of the death last week of this talented man is telegraphed from Indiana, where for some four years past he has been engaged in electrical work for the Fort Wayne Electric Company. Mr. Slattery was one of the most popular as well as most ingenious of electrical workers, and began his electrical work in England, his native land, at a very early age. On coming to this country he first resided in Boston, where his work on incandescent electric lighting attracted the attention of capitalists. His successful work with the alternating current system of incandescent lighting was brought to the attention of Mr. R. T. McDonald, the far-seeing and energetic manager of the Fort Wayne Company, and soon Mr. Slattery was pleasantly situated in this enterprising Indiana city, at the head of the electrical department of this big company. Of recent years, in addition to his routine work, Mr. Slattery has devoted himself to the perfection of the storage battery, and good results were looked for at his hands.

In the ELECTRICAL REVIEW for October 5, 1889, appears a picture of Mr. Slattery mounted on his electric tricycle, a peculiar invention of this interesting man.

Mr. Slattery was a man of talent in many ways. An eloquent, poetical speaker, an interesting and instructive conversationalist, his company was ever sought, and he made friends wherever he went. The REVIEW deeply regrets to hear of his death, which takes from us one of the most unique, capable and interesting characters known to the electrical fraternity.

No Injunction.

The Supreme Court, general term, has affirmed the judgment, with costs, in the case of the W. J. Johnston Company, against Walter T. Hunt, a former employé. The plaintiff sought, under a contract to restrain Mr. Hunt from working for the *Electrical Age* Publishing Company, but Judge Truax at the Special Term, on the 12th of May last, dismissed the action in favor of the defendant, on the grounds that the plaintiff's remedy was to be found in a suit for damages and not by injunction. This judgment was appealed from, with the result above stated.

TELEPHONE CHAT.

Workmen are engaged in stringing copper wires across the Delaware and Hudson bridge, between Green Island and West Troy, to complete 10 trunk lines between Troy and Albany.

The Central Pennsylvania Telephone and Supply Company has purchased a lot on Lackawana avenue, in Scranton, and will soon erect a building upon it for the use of the Scranton Telephone Exchange. The building will contain all modern requirements for telephone service.

The city council, of Durango, Colo., refused to grant permission to the Bell Telephone Company to use the streets for its wires. The objection was that the company has contracted with 70 subscribers at $80 per year; that its patents will expire in March, that the service will then become cheaper, and that it would be short-sighted policy to permit citizens to bind themselves with an $80 contract, when, by holding off till March, cheaper service will be possible. Will it?

It has been rumored in Baltimore that a new company will be formed to oppose the Chesapeake and Potomac Telephone Company. It was stated that the people interested reasoned that the new company would be able to use the Bell system, because of the expiration of his patents in March next and January, 1894. It is evident that these promoters have not taken into consideration the fact that only the fundamental patents expire, and that so many improvements have been made in the telephone system, that the idea of using only the fundamental patents, and running in competition with any of the present companies, would be, to say the least, unique.

LETTERS FROM A LABORATORY.—XXVI.

BY JULIAN A. MOSES.

The new material, quartz fibre, for suspensions for astatic combinations, mirrors, etc., in galvanometers, has been proven to be so superior to the old silk filament, that quartz fibres are generally used in those galvanometers that are now manufactured by the best instrument makers. Several dealers have endeavored to place these quartz filaments on the market for the use of experimenters, but without great success. They can, however, be purchased, but their great cost makes it a matter of moment for the experimenter to change his suspension from silk to quartz. I know of several cases where this has actually occurred. Where the experimenter can make his own filaments, it is evident that this expense will be saved. A few points, therefore, about the successful manufacture of these delicate strands of pure quartz will prove of value.

Several devices for drawing quartz out into this attenuated form have been devised, and they have met with variable successes. One form is the well known bow-gun, by means of which the melted quartz is shot out from the arc, and the arrow to which the filament is attached remains with its point buried in some piece of soft wood, placed in its path for that purpose. This method is good, but it is not as easy of manipulation as it would at first appear. The gun and arrow are difficult to make properly, and if they were to be made by a mechanic, the cost of the apparatus, if only a few suspensions were to be made, would exceed that of the quartz fibres themselves. The following directions, if carefully followed, will enable any one provided with an arc lamp and current to successfully manufacture those useful filaments without much trouble or expense.

Pivot a lath or thin strip of board about five feet long, on and near the edge of a low table, so that it will swing with ease, and that the arc described by the free end will be at least 90 degrees. Attach a clamp made of a piece of sheet brass bent to resemble the thumb and first finger of a hand, so that the spring will be strong enough to hold the piece of quartz firmly in position. Fix a rubber band to a point on the arm about three inches from the pivot, and fasten the other end to the table so that the tension of the elastic will be about five pounds when the arm is furthest away from the table. In order to have a brake, or stop, it is only necessary to fasten a piece of spring brass bent in the form of a <, so that when the arm swings it will not pass the edge of the table, but will stop in a manner similar to that of a door controlled by a door check. Suspend the arc lamp in such a position that the points of the carbons will come on a level with the end of the arm, and so that a piece of quartz held in the clamp will touch the arc when the current is turned on. Some prefer to use a magnet to repel the arc to the side on which is placed the quartz pebble to be "shot"; but this is merely a matter of preference, as it is necessary to have another pebble in the arc to which is touched the one held in the clamp. It is, therefore, immaterial which pebble the arc favors. Let an assistant hold a large elongated quartz pebble, by means of a pair of old insulated pliers, in the arc, and bring the arm holding the clamped pebble between the points of the carbons, so that the two pebbles just touch. When they are sufficiently melted by the intense heat, let go of the swinging arm, and it will fly from the arc, bearing in its train a filament of quartz. But were no precautions taken it would be a matter of extreme difficulty to find the filament after it was made, without breaking it. To avoid this, some means must be employed in advance to secure the fibre. This may be done by spreading on the floor immediately below the apparatus a piece of black glazed paper, so that when the fibre falls it may be readily seen.

It may now be picked up with a black ebonite rod, and broken into a number of pieces of the required length. These should be kept in long glass tubes.

Quartz *pebbles* must be used, as the crystals have been found to give imperfect results.

Variable Speed Power Transmission.

BY H. C. SPAULDING, EXETER, N. H., BEFORE THE SOCIETY OF MECHANICAL ENGINEERS.

If such an estimate could be made with any approach to exactness, it would be most interesting to know how many pairs of step pulleys are to-day in operation in the United States alone. Surely there are few mechanical contrivances more generally accepted and incorporated into every class of machinery for affording a simple and ready means of changing the speed, either of the entire driven mechanism, or of one or more parts of it, independently of others. Yet their inherent defects are so well known as to call for hardly more than bare mention, in order that they may be borne in mind while considering the device presented below. Inability to produce speeds other than those predetermined by the ratios of corresponding steps; the limited number of such speeds except as obtained by large and unwieldy cones with an excessive number of radii, at a corresponding expense in stock and finishing cost; inconvenience of shipping belts except as applied to light work and without stopping the machine, or at least depriving it of driving power while the change is being made; enforced parallelism of driving and driven shafts; all are considerations so thoroughly appreciated by practical engineers and designers, as to call for no extended comment. The demand for something which should offer the same advantages, with fewer attendant drawbacks, has been partially met by a number of devices which have become more or less well known, in connection with various classes of machinery.

In spinning apparatus, speeders and fly-frames allow the use of continuous element

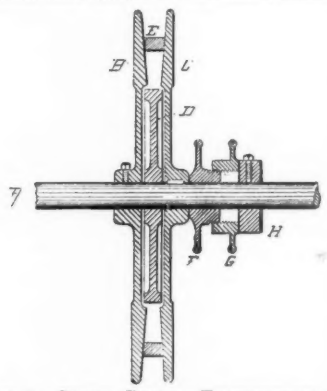


FIG. 1.—SPEED POWER TRANSMISSION.—CROSS SECTION OF PULLEY IN MIDDLE OF SHAFT.

cones, the shafts being conveniently placed near together and parallel, while a continuous and gradual change of speed is obtained by slowly and automatically shifting the belt from one end of the cones to the other. Were the required range of speed greater, however, or the change more rapid, the device would evidently not produce such satisfactory results.

In wood-working machinery the use of a wheel so arranged that it may traverse a driving disk, its edge thus attaining a speed corresponding to that of the disk at varying distances from its center, has been tried with more or less success, but the frictional contact (theoretically a line only) is so slight that sawdust or dirt of any kind, on wheel or disk, is liable to interfere with uniform action, while the axis pressure of both parts must be excessive, and the driven shaft varies its position with every change of speed, necessitating an extra link in the mechanical transmission, with a consequent friction loss.

The Evans friction cone has recently been applied to a number of problems of this character, but is open to the objections inherent in all continuous cones, while the shafts must be close together, and expert opinions differ as to the durability of the belting used, owing to the peculiar and rapidly recurring stresses to which it is subjected when in operation.

Without dwelling upon other devices for obtaining the desired results, we come to a type of apparatus which seems to the writer to overcome most of the difficulties noted, in a simple and effective manner, the invention of Mr. E. F. Gordon, mechanical engineer of the John A. White Company, of Dover, N. H. In the opinion of those most interested in its development, it is worthy of more extensive trial and investigation than has been or can in the immediate future be given it in the line of machinery to which it is now being applied, and in presenting it to the society it is hoped that its possibilities and limitations will thereby be more clearly brought out by actual demonstration.

Simply stated, the device consists of a deeply grooved pulley, split by a plane perpendicular to its axis, and dividing it symmetrically, with means for varying the distance of the two parts one from the other.

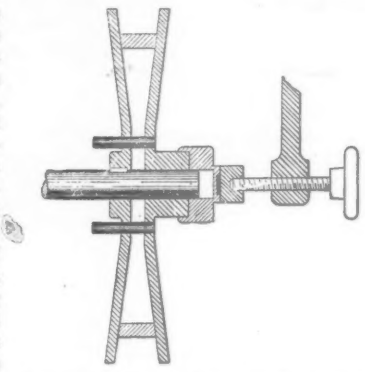


FIG 2.—SECTIONAL VIEW OF PULLEY AT END OF SHAFT.

Given a belt adapted for the purpose, it will, in running on such a pulley, lie nearer the center as the two parts are more widely separated, and recede as they are brought nearer together. Such a pulley may be used on either the driving or driven shaft, or both, and it is evident that the shafts may be at any practical distance apart, also that the greater the pull on the belt, the greater its hug and consequent freedom from slip. In some cases it is desirable to place a loose pulley between the two parts referred to, making a compact arrangement for starting, stopping and varying speed, in the space ordinarily occupied by a single pulley of the usual style.

Fig. 1 shows such an adaptation of the device, with one of the many available arrangements for varying the working radius of the pulley. In the illustration, *A* is the shaft, *BC* the two halves of the pulley, *D* the idler, *E* the belt, *FG* hand wheels, *H* a collar fast on the shaft. By the action of the belt, *B* and *C* tend to separate from each other, and since *B* is fast on the shaft, *AC*, which is splined on the shaft, and hence must turn with it, although free to move along it, is forced against *F*. The hand wheels, *F* and *G*, are free to turn on the shaft, but may be held at rest whenever desired. The hub of one carries a male screw, and the other a female, so that by altering the position of one on the other, they increase or decrease the distance between the collar, *H*, and the half of the pulley, *C*, thereby allowing *C* to recede to a greater or less distance from *B*, and determining the position of the belt, *E*, and its consequent speed relative to that of the shaft, *A*. It will be evident that in this construction, when used as a driving shaft, the belt speed will become less and less as *F* is screwed into *C*, until *C* has so far receded from *B* as to allow the belt to drop on to the idler, *P*, when the driven mechanism will come to a standstill, to be gradually started again by the adjustment of *F* and *G*.

Fig. 2 shows a still simpler form, applicable when the pulley is located on the end of a shaft. In this case the loose pulley is omitted, it being assumed that only a speed adjustment is necessary, one part of the pulley being fast on the shaft, the other free, but loosely pinned to the first so as to rotate with it, the working radius being determined by the adjustment of a hand screw.

The belt may be either round or nearly square in section, though for the most of the experiments so far made a narrow double ply leather belt has been used, with the edge beveled to correspond with the angle of the pulley's face.

The construction shown in Fig. 2 has recently been applied to the feeding rolls of a 48 inch band resawing machine in a way which illustrates its simplicity and adaptation to this class of work.

Fig. 3 shows the arrangement of parts, *A* being the split pulley, its shaft being driven by a link belt from a continuation of the lower band wheel shaft, and supported by an arm, *B*, swinging from this as a center. The belt, *C*, drives the pulleys, *DD*, on horizontal shafts worm-geared to the axes of the feed rolls, the swing of the arm, *B*, compensating for the varying length of the belt, *C*, owing to changes either in position of the feed rolls, *E*, with reference to the saw, or in the working radius of *A*, the latter being determined by the position of a hand screw.

The diameter of the split pulley is 12 inches, the minimum working radius three inches, giving a linear speed to the surface of the feed rolls of from 10 to 30 feet per minute. A double ply belt one inch wide is used, and its power is such that if the stock be held firm, the slip occurs between it and the feed rolls (four in number, all geared, 18 inches long, 3 inches diameter), and not at the belt, as in the case of the usual style cone pulley formerly used with a machine of the same capacity.

No dynamometric tests have yet been made, but a pulley six feet in diameter is now nearly ready for careful investigation as to efficiency under widely varying loads and speeds. Should the results be satisfactory, the simplicity, compactness, reliability and cheapness of the device would apparently warrant its extensive use by the engineering fraternity.

Electrical Advertisements.

The question of search-light advertisement is not so new as some people may think, as it was discussed in our office long before Mr. Curtice's patent was taken out, says London *Industries*. We do not wish, however, in the least to deprive Mr. Curtice of the credit, or of any more solid return from his invention. As another method has also been under discussion, we think it well to make it public, though it still seems a little difficult to carry out. Nevertheless, this second plan may perhaps be made a brilliant practical success, say, by Mr. Romeike. The ordinary alternator makes a continuous hum, because the curve of one half period is the same as that of another. By building special alternators any curves could be produced. Any speech can be represented by a curve, as drawn, for instance, by the old phonautograph. The dynamo is, therefore, built to give the curve corresponding with the advertisement. For instance, suppose the advertisement ordered is "Someone's Soap," the dynamo is designed, not to hum in the usual monotonous way, but to sing "Someone's Soap, Someone's Soap"—one repetition per revolution. The transformers in the house are also arranged to hum a little, and sounders are applied throughout the system of distribution. There is thus added to the noise of a busy city the persistent but unobtrusive substratum of "Someone's Soap, Someone's Soap." At present there is often a feud between the telephone and electric light interests, but if the foregoing suggestion were carried out peace would reign. The advertisers would compensate the telephone companies, so that when leaks or induction took place, instead of the distracting low G sharp now heard in the telephone, there would be the pleasant murmur of "Someone's Soap, Someone's Soap." For our own part, we

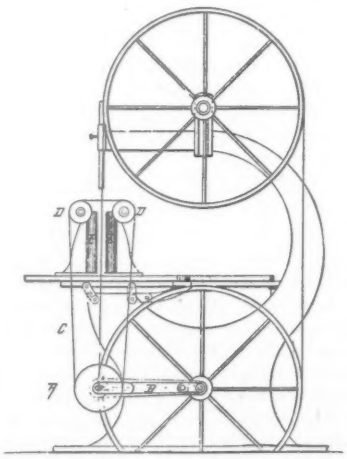


FIG. 3.—APPLICATION OF SPLIT PULLEY TO FEED ROLLS OF BAND SAW.

would much prefer its soothing tones to the tangle of "Are you there?" and the hot-tempered language generally heard in the telephone. We hope, therefore, that this scheme will be worked out.

An Epitaph.

Good Richard Simms, of Cynthia, Kentucky,
A poor horse trainer, has been quite unlucky;
He thought the sparks from an electric wire
Were fireflies, and now he's gone up higher.
—*N. Y. Recorder.*

THE PRUYNWAY.

A NEW ELEVATED ELECTRIC RAILWAY SYSTEM.

BY HENRY S. PRUYN.

A new elevated electric railway system, known as the Pruynway, is shown in the accompanying illustrations. The picture at the left gives a perspective view of the structure of the girder and of the rail which it carries on top of it and the two current conductors carried under the lower flanges where they are not only insulated, but protected from damage by the weather or any other cause. Slightly below the level of these power current conductors, and between them and below the structure, is a space for telegraph, telephone, light or any other electric lines, which are also protected from interruption by snow, ice or other causes. As these conductors are firmly fastened and completely protected, there is no danger of short circuiting or leakage of any of the current.

The track and its structure stand on posts high enough to permit free passage for the public below, and to prevent all interference. Freedom from obstruction by snow is secured, even in the most snowy regions; and the drifting of snow and cleaning it away from tracks on city streets is a serious nuisance which this system entirely escapes. In fact, no obstructions of any kind, intentional or accidential, are liable to occur.

In the Pruyn method of operating the electric power and current, the system does not depend upon the ordinary ground circuit. Instead of the return current being allowed to pass through the structure to the ground, it is passed from generators stationed at suitable intervals along or under the railway line, out through the conductor at one side of the structure, and picked up and carried by a suitable truck conductor to the car motor, and after having performed its alloted labor in driving the carrying wheel which rests on the top of the main rail, passes down on the other side of the car through a suitable conductor, into the opposite guide wheel below, which delivers it to the current conductor on that side and returns it to the original generating dynamo. This arrangement, it is claimed, provides against induction from the heavy power conductors used for propelling the cars, to the comparatively light telegraph and other conductors adjacent, as well as to all contiguous electrical lines whether included in the railway structure or not. Thus, freedom is secured from short circuiting as well as from grounded or crossed wires, to say nothing of interruption by reason of the gathering of snow, ice or moisture from any source.

Again, atmospheric conditions have no effect on the electrical conductors contained in the Pruynway structure or supported by it, for the reason that lightning discharges, whether heavy or light, taking effect upon the structure, pass invariably to the ground directly through the metallic sustaining posts.

The next view is an end elevation of one of the cars broken away at the center sufficiently to expose the car truck. At the top of the truck is seen one of the carrying wheels resting on the track rail; at the bottom of the truck are seen the pair of guide wheels picking up the current from the conductor under one side of the structure, while the other guide wheel returns it through the conductor on the other side after it has done its work of driving the motor which rotates the carrying wheel on the track. Each car is self-propelling and the cars may be run singly or in trains. The weight of the car and its load is carried low on either side of the track rail, and largely below. The strengthening framework of the car is in the floor, and a large proportion of weight in addition to this strengthening frame is in the low-hanging trucks, of which there are two for each car. The carrying wheels bear the car by means of heavy pintles, with spring bearings on which the weight of the the car rests. The carrying wheels are said to run on and pass curves without the grinding action inseparable from the ordinary car truck, which of necessity passes over a

greater distance on curves with its outer than with its inner wheels, compelling one or both wheels to have more or less sliding friction, according to the abruptness of the curve around which the car is passing. The weight of passengers or freight, instead of being carried as usual several feet *above* the level of the track, is carried considerably *below* this level of oscillation; and the construction of the car itself, with the main weight in the floor framework, tends to still further lower the level of the center of gravity of the entire moving body as compared with the track rail level. The pair of guide wheels is positively prevented from separating beyond a certain limit sufficent to allow free passage on each side along the power conductors, not only regulating the position of the car on the track, but maintaining an uninterrupted electrical contact for propulsion.

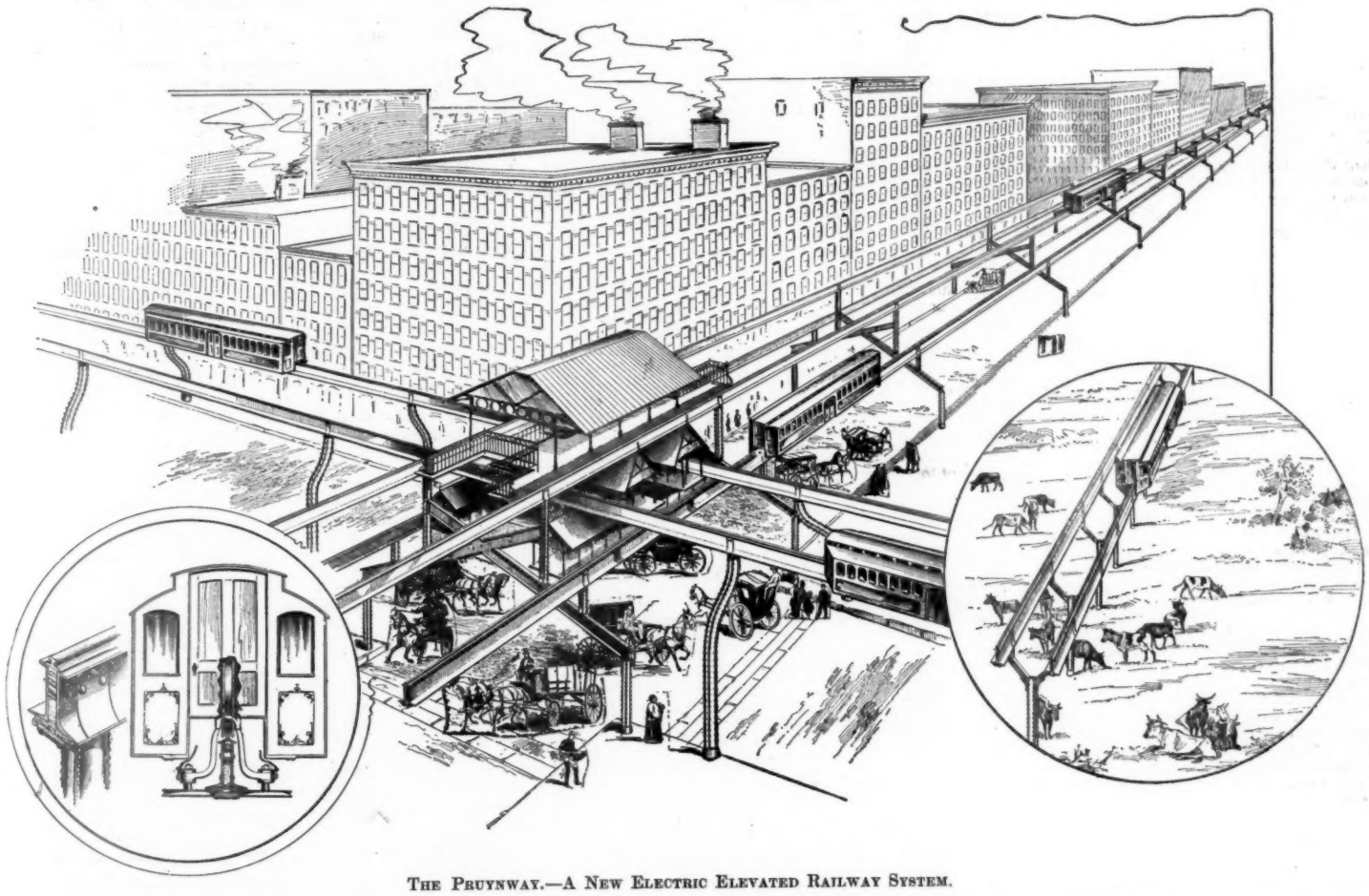
There is a door at either end of the car for the use of the motorneer and other employés. Doors for the use of passengers are provided in the sides of the car. Passcient for it. There are no grade crossings for wagon roads, footpaths or railways, and thus no liability of damage to persons or property from passing trains, smoke or accidental fires from locomotive sparks. The Pruynway needs no grading, ballasting, draining, culverts, fencing, telegraph posts, cattle guards or small bridges; no bridges are required except over large streams and ravines. The Pruyn road passes over bridges without obstructing footpaths and roadways; and as the electric current which propels the car is broken on draw-bridges by the opening of the draw, the cars cannot run upon a draw-bridge or approach it while the draw is open. The line can run through agricultural lands with no more interference with tillage and grazing than would be occasioned by a series of trees standing several rods apart. Cars and trains can be run at a speed limited only by the rate at which the driving wheels can be rotated by the heavy electrical current, without the necessity of stopping for supplies of water and fuel, for re-oiling journals driven by the other alone, the return current passing through the ground, as in the method at present customary with the trolley system, until the damage is repaired. The chances of both conductors on any given section of the road between two generating stations becoming disabled at the same time are extremely remote.

The wear and tear and the consumption of fuel in generating power at local stations are claimed to be far less than with locomotives. Repairs of stationary machinery are less frequently necessary and more economically made. On the whole it is claimed that the system is as decided an advance in its applicability to long distance transit as to interurban service.

The large central view shows the system as applied in cities, with a three-story station at the intersection of two streets, for the accommodation of passengers on either of the three lines of railway shown. Through express cars run on the two highest tracks of the main line; local accommodation cars run on the lowest pair of tracks, effects of the weather. When once built it has no sources of destruction to contend against but the slight legitimate wear of trucks and motors and ordinary use of cars. There are no joists, and the strains are reduced to a minimum by the light weight of the rolling stock and the superior method of forming the sustaining girder. The expenses of city viaducts and sunken ways are saved. In case of emergency the station agent controls the movements of all cars on his section, as the supply of current is under his control.

Owing to the form of the railway and cars, the car floor is run about 10 feet lower or nearer the earth's surface than in ordinary elevated railways, while preserving an equal amount of clearance beneath the girder. This saves from 15 to 20 stairs in ascending to the stations.

The cars are lighted and can be heated by electricity under instant control, without danger from fire or steam under any circumstances. The cars are not liable to dangerous injury from the breakage of trucks,



THE PRUYNWAY.—A NEW ELECTRIC ELEVATED RAILWAY SYSTEM.

sengers sit comfortably, back to back, separated by a narrow aisle or passage way for the use of the motorneer, and facing the sides of the car. The arrangement of the car is such as to afford facilities for comfortable sleeping and other accommodations.

It will be observed that the car is, so to speak, locked to the track, and, as long as there is any track there, or structure, it cannot be derailed. This element of safety is an essential feature of the plan.

Not only is the railway relieved from the duty of carrying locomotives, tenders and fuel, but from carrying the great extra weight necessary for cars built strongly enough to stand the strain and concussion incident to locomotive-hauling, and the weight of the ordinary double-track elevated structure with its cross-ties and guard-timbers. This fact tells heavily in favor of the Pruyn system as regards both the cost of the structure and the expense of maintenance. The Pruyn car, it is said, runs without oscillation at all speeds.

The view in the right hand panel will give an idea of the Pruyn method of construction for a cross-country, double-track road. A right of way one rod wide is sufficient for it. There are no grade crossings for wagon roads, footpaths or railways, and thus no liability of damage to persons or property from passing trains, smoke or accidental fires from locomotive sparks. The Pruynway needs no grading, ballasting, draining, culverts, fencing, telegraph posts, cattle guards or small bridges; no bridges are required except over large streams and ravines. The Pruyn road passes over bridges without obstructing footpaths and roadways; and as the electric current which propels the car is broken on draw-bridges by the opening of the draw, the cars cannot run upon a draw-bridge or approach it while the draw is open. The line can run through agricultural lands with no more interference with tillage and grazing than would be occasioned by a series of trees standing several rods apart. Cars and trains can be run at a speed limited only by the rate at which the driving wheels can be rotated by the heavy electrical current, without the necessity of stopping for supplies of water and fuel, for re-oiling journals or changing engines, and can be run without danger or inconvenience within or without, at full speed, through the most densely populated towns as well as anywhere else. They can be ferried across large bodies of water more easily than other cars, as the rolling stock is so much lighter.

The journals are at all times accessible to the motorneer, without stopping for inspection and oiling. The same cars used on long lines are run into the heart of cities at full speed on the same pattern of track. Each car can be dispatched singly or otherwise, as soon as loaded, either with passengers or freight, without the necessity of making up trains for locomotive-hauling, dispensing with the vast areas of yard-room now devoted to the accommodation of freight cars waiting to be shunted and hauled out. The cars have as large a capacity as any now in use.

Switching or shunting is done with perfect safety, on account of automatic current breaking devices which render it impossible for a car to run into an open switch. The power current can be sent through either of the side electrical conductors; and in case of damage to one conductor, the car can be nearly over the curbs on each side of the street. Cross-town cars run the pair of tracks at a level half way between the respective levels of the express tracks and the accommodation tracks running up and down town. The Pruynway, owing to the upright position of the track structure and the small size of its several parts, does not perceptibly darken streets, sidewalks, store fronts and the windows of buildings, and, of course, presents no objection from sparks, cinders, smoke, steam or drippings from the water tank or from the oilers. The system is practically free from noise, the cars making less noise than an ordinary wagon. The availability of the system for rapid transit from cities and towns where safety, reliability, comfort of passengers and neighboring residents, economy and dispatch have not heretofore been satisfactorily attained, stands out as a prominent feature.

The structure is a *permanent way*. Once made, it is there for years. It does not require the expenditure necessary in ordinary railroads to keep in repair their 2,500 ties and 350 rail joints to the mile on a track-bed exposed to the action of rain, frost and other should such a thing be possible, as the remaining truck suffices to retain the car locked on the track until it stops, and then continues to hold it there. At each truck, safety rollers are provided which would take its place in such an emergency in sustaining and guiding the car at that end and keeping it in position.

Locomotives by the action of the pilot and fire box, and surface cars, by the trucks, act like an air pump when passing along at high speed, to form a vacuum under the train, consuming much power directly and creating a heavy load of air pressure on top of the train from the movement of free air to fill the vacuum. Were the vacuum total, there would be a pressure weight of fifteen pounds per square inch, involving an almost inconceivable extra load, and, as it is, the added labor on the propelling power is enormous. The extraordinary strength necessary for cars on fast surface roads is not merely to resist shocks and sustain the load and protect it from the weather, but largely to resist the suction of air pressure when running fast. From this tax, the Pruyn car escapes by running high above the ground with free air below as well as above, and no downward projections creating a vacuum underneath. The cars, having no trucks below the floor, pass through smaller tunnels than ordinary cars of like capacity, tunnels for them requiring only about two-thirds as much cross-section.

Electricity in the Art of War.

BY LIEUT. C. D. PARKHURST, U. S. A.

Each seacoast fort will have to overlook and protect a system of submarine mines and torpedoes. These may and probably will reach to at least beyond mid-range for our guns, a distance that will render all unaided night operations, even with patrol boats, a very uncertain operation.

But with a powerful search-light, ready to be turned on at any instant, the mine-field may be swept in a few moments. Patrol boats may, in fact must, be provided with search-lights also. The enemy may thus be prevented from any attempt at countermining, conducted under cover of darkness. Night may at any moment be turned into day, the enemy's search-light met with search light, and, as much as possible, the advantage maintained for the defense.

That these search-lights should be the best that money can buy and electrical science produce goes without saying. They should be permanent installations with their towers and protective screens complete, and be so located about the work as to command all approaches thereto, and also at any time be able to give a cross fire of light, so to speak, to screen the work or to cover any land disposition that may be desirable. Portable lights may also be of use; but in the main, more powerful lights than possible with a portable engine and dynamo will be needed. That the search-light can be and has been made powerful enough for its purpose, the following will show:

In experiments upon the French coast a vessel was picked up at a range of more than 3,000 metres, and from this moment could be followed in all of its movements, be abandoned, and be again picked up with ease. The buoys in the harbor could all be seen, the furthest being 2,600 metres away. Tried for an extent of field, a space of more than 207 metres long at from 3,000 to 3,500 metres was sufficiently lit up for all operations of artillery.

Tried for a maximum range, the observer, with good opera glasses and placed near the apparatus, could readily see the barracks 9,500 metres distant, and at an altitude of 500 metres. The experiments were made during a dark night. A light mist prevented the air from being absolutely clear.

In another experiment the light was turned and kept upon an approaching steamer. The captain on arriving near the observers, expostulated with them; the light had prevented him from steering, and several times nearly collided with other craft.

Sautter, Lemonnier & Company make four sizes of projectors, viz.: 0.30 m., 0.40 m., 0.60 m. and 0.90 m. diameter, with lights from 6 mm. to 15 mm. The largest projector will light a circle 175 metres diameter at a distance of 7,000 metres. These data are nine years old. The Eiffel tower carried a light far beyond any of the above. With a current of 100 amperes and a projector of nearly 36 inches diameter, it was possible with a good night glass to distinguish the details of objects lighted by the beam at a distance of from four to five miles. In the exhibit of the Paris Exposition, Messrs. Sautter, Lemonnier & Company had a projector of 56 inches diameter. The amplifying power of this great projector is enormous, being 5,625 for a lamp of 150 amperes and giving from 100,000 to 110,000 candle power; the intensity of the beam projected from this lamp would be, therefore, from 500,000 to 600,000 candles, or from eight to ten times the power of the two 36-inch projectors placed upon the tower.

Besides the light or lights for general observation and watching with which the fort must be provided, other lights are also imperative for the following reasons:

The employment of the electric light is perfectly simple as long as it is only a question of one fort and one gun or group of guns; but when it becomes several forts and several lights the action becomes more complicated.

To avoid confusion each group of guns should have its own light, to be under the control of the commander of that group. Nothing but confusion can result from the unconcerted employment of several lights by independent observers, who work neither in combination with each other or with the guns, and are not connected with any part of the defense by any means quicker than an orderly. Just at the moment the light might be most needed by a group of guns, it might be turned off from its target and be swept to some part of the field not commanded by that group. We should, therefore, have a light for each group of guns as well as for each fort.

The light should be posted where it will be least likely to be hit, and in such a manner as not to interfere with the fire of its own or any other group of guns by dazzling the gunners. Schemes have been advanced for the protection of the light by placing it behind cover, and using its rays indirectly by a combination of mirrors.

Wherever it may be it must be under the sole control of the group commander to which it belongs, and its movements directed by him alone.

There must be electrical communication between the group commander and his light, and he should be able to control the movement of the light from a distance. There is no real difficulty about this. It is known that one of our prominent electrical companies has already solved the question in part, giving absolute control of the light beam both horizontally and vertically. If the control could be made *automatic* as well, so that the beams would always point to the same object as the group commander's telescope, the problem would be solved completely.

To avoid confusion of lights, only that fort and group in action should show its light, except at intervals to sweep its mine-field and prevent any chance being made under cover of a demonstration against some other work.

Page on page might be written on this subject of the search-light, but space does not permit. We will only pause to say that we need the light *now* in limited numbers, for the same reason that we need guns and torpedoes. Besides this a demand should be created to stimulate our home manufacturers in this direction, so that there may be the certainty of our being able to get what we want when we want it, and at comparatively short notice. Gun steel was not to be had in the country, until we held out some hopes of a contract for its supply in quantities to make it pay. The same demand for the electric light would soon place us upon an independent footing, giving us at the same time, what we now have not, the means with which to drill and practice and find out the capabilities and field of usefulness of the light.

The search-light, indispensable as it is, is not the only light we need. Our forts need internal illumination certainly for war, and as certainly for peace. If we are to be prepared we must practice night as well as day firing. Gun platforms, casemates, galleries, magazines, shell-rooms, and all the approaches thereto, should be capable of being sufficiently lit for night work, and with the incandescent lamp the success that it is, the oil lamp is a relic of the dark ages.

With the incandescent lamp we can have a light at will, as much or as little as we please. The lamps can be placed singly or in groups, and of whatever candle power desired. They can be protected from the storm; they can be guarded by globes and wire screens so as to be reasonably safe from injury; furthermore they can be arranged to be removed at will, so that they need not be permanently installed any more than the oil lantern; the wires and fixtures can be put in place and the lamps be put in their sockets only when needed, thus greatly diminishing the liability to breakage when not in use.

For magazine illuminations and shell-room work nothing could be safer. The lamp proper can be put inside a heavy protective globe, with outside wire guard if needed. Even the naked lamp globe would not be dangerous; for break a globe with the lamp in action, and the light is gone instantly without any falling ash or sparks. The loop is so fine that it is instantly dissipated into gas the instant the air strikes it and it consumes.

Our guns are provided at enormous cost without there being any return thought of, except the protection and immunity from war that their presence provides, and the active work they perform against an enemy in the event of war. The dynamo and electric light plant is needed as an essential adjunct to their proper use. Hence, they, too, should be provided as war material, with no thought of return, except as with the guns.

Much has been done in the navy, both on board ship as well as on shore, towards the development of special types of dynamos for naval use. Such special types are necessary on board ship from the limited space available for the electric plant, as well as from the unstable platform of the rolling and tossing ship.

Our navy has shown that it is possible to use arc lights and incandescent lamps from the same dynamo. In the land forts this may or may not be advisable, depending upon the character of site and size of fort. In the general case it might be more advisable to provide special dynamos for the search-lights independently of those for the incandescent circuit. But whatever the condition of the problem it can be safely assumed that they would not be insuperable, and that electrical science could in time give us just what was wanted. The thing has got to start some time; it might as well begin now as some time in the future. We then would be benefited and be fitting ourselves for proper service in time of war.

In our latest war ships the dynamo, having come to be considered a vital element, is placed below the protective deck, to be as fully protected as possible from all injury from hostile attack. Our dynamos and engines should be similarly located in the most invulnerable part of the work, under a thoroughly bomb proof casemate.

The voltage to be used and the system of wiring necessary would depend in great measure upon the extent of circuit to be covered by the installation. It is possible to wire in such a way that there would be but little danger of a total extinguishment of lights from any damage but shot or shell. Interlocking systems of wiring could be used, such that even if a branch or main were shot away, that branch or main could be made active by switching it on to some other live branch or main.

In general the length of circuit would be such that high voltage would not be needed for economical results. The navy runs on an 80 volt circuit, but their circuits are comparatively short. We probably could run on a 100 volt circuit; at the outside, on one of 220 volts; from this it results that there would be no danger of shock, even if wires should be cut, and the ends be exposed to contact with the human form. With due care there need be no fear of fire. With proper safety fuses the dynamo could be secured against danger from any short circuit, caused by shot or shell carrying away or bridging mains, branches or feeders, and the whole installation could be made efficient and reliable and fairly economical.

It goes without saying that the installation would not be complete without a complete switchboard, with regulators, ammeters, voltmeters and ground detectors. These have come to be considered as fully needed as the steam and water gauge and safety valve of the steam boiler.

Passing by the system of signaling, telegraphy and telephones necessary for the administration or the fighting of the modern fort, as needing but simple mention to be conceded, we come to another branch yet of the greatest importance to our fighting capacity. To serve our guns we must have ammunition in quantity and in quality, according to the demands. That the quality may be the best, we must have well ventilated magazines for general storage, where the best of care can be taken of our explosives. That the quantity may be at hand, we must have some means of serving from the general to the service magazines, and from the latter to the guns.

The search and incandescent lights already mentioned means the installation of the best of dynamos and the steam engine with which to drive them.

Here, then, is our power, and an electric railway and electric shot hoist are the means of applying this power. By this means, with suitable trucks and motors, the work can be done better and cheaper than by mule or hand power. The dynamo plant we *must* have, the electric road follows as a natural corollary. It can be located so as to run from storage magazine throughout the entire fort to all the service magazines. At these magazines electric hoists could be provided to lift the heavy weight of our modern cartridges and projectiles, and the whole thing be run with a minimum of hand labor, more rapidly, more surely and more cheaply than by any other method. And even if the wire be shot away in battle, we yet would have the track and trucks, and would simply have to apply hand power to get along as best we could until the wire could be replaced.

Passing on to another problem that affects our fighting capacity, we come to our ability for the prompt handling of our modern high powered and heavy ordnance. Can we handle and serve these guns thoroughly and efficiently by man power alone, or must we call in other power to our assistance? It would seem to me that the necessity of the case, the duty of getting all that is to be gotten from the service of our heavy and costly guns, that from their very cost may be few in number, demands that we should have other than man power to manipulate them.

If, then, we are to use outside power, what power is it going to be, and where is it to be obtained? We must use steam, compressed air, water under pressure, wire ropes, shafting, carbonic acid, ammonia or electricity as the aid to hand labor. Some of these means of generating or transmitting power may be dismissed at once, as either too cumbersome, expensive or inefficient.

In the consideration of the problem for military purposes inside of our forts, not only the efficiency of the generator and the means of transmission must be considered, but particular attention to and consideration of the means of reconversion of the power when delivered is of prime importance.

So it would appear to me that steam, as directly as well as indirectly applied through the steam engine as the final motor, is in no way applicable to the solution of our problem. We, therefore, come to our last resource, electricity.

Prior to the year 1873 the transmission of power by electricity may have been the dream of some electrical expert or student, but it was not an accomplished fact. The dynamo as a generator had been well developed, and at the Vienna Exhibition large installations were exhibited. *By accident* the mutual interchangeability of the generator and motor was discovered in some of the preparations for the exhibition, and from this time on experiment and research were bent to the solution of this most important subject. At the Munich Exhibition in 1882, it did not fail to receive a share of attention. The experiments of M. Deprez are well known to electrical scientists.

From this time on the progress of this branch of electrical science has been most rapid, each successive year seeing more efficient generators to supply the current, more efficient motors to use it, better appliances, mechanical constructions and understanding of the best voltage to be used, until, now, it has passed beyond the experimental stage, and is upon a broad and solid foundation of commercial approval and success.

The efficiency of the system depends upon three things, each evidently less than unity.

1. The efficiency of the generator, which now ranges as high as 95 per cent.
2. The efficiency of the motor, also ranging from 65 per cent. for small motors up to 90 per cent. for those of large size.
3. A third factor enters the problem, depending upon the rate of rotation of the motor armature and the resistance of the circuit.

(To be continued.)

Buffalo Electrical Society.

At a meeting of the Buffalo Electrical Society, held December 5, Mr. P. K. Stern read an interesting paper on "Electric Heaters." The attendance at this meeting shows that the society has opened the season with its old-time enthusiasm.

At the next meeting Mr. Frank Kitton will deliver a lecture on magnetism, and at a subsequent meeting A. C. Terry will lecture on the subject of electric motors, treating it in a popular and elementary way.

The Society is considering the project of a series of lectures on electrical engineering known as the University Extension Course. The members of the Buffalo Society of Natural Sciences are very much interested in this course of lectures, and the prospects are that the plan will be eminently successful. The lectures will be delivered by one of the best electrical engineers in the State.

The following officers have been elected for the years 1892-3: President, Frank Kitton; vice president, P. K. Stern; secretary, Astley C. Terry; treasurer, Samuel Stewart; librarian, John G. McNerny; executive committee, Frank Kitton, A. C. Terry, P. P. Jones, John P. Chapin, P. K. Stern, Samuel Stewart, F. A. Hallock, Geo. A. Burnett.

An Interesting Meeting.

A conference committee, consisting of a special committee of the San Francisco Chapter of the American Institute of Architects, of the California Electrical Society, and Geo. P. Low, as representative of the Pacific Insurance Union, was held in the rooms of the Fire Underwriters' Association of the Pacific, San Francisco, on the evening of November 23, for the purpose of discussing the subject matter of a paper prepared by Mr. Low for the October meeting of the Underwriters' Association on "Electrical Impostors," and of devising means by which the ideas contained therein may be enforced. The organization of the meeting was effected through the election of Mr. Low as chairman, with H. T. Bestor, editor of the *California Architect*, as secretary. As the result of the deliberations, a resolution was adopted requesting the Electrical Society to prepare a general set of specifications under which accessible wiring may be placed, and also to prepare a second set of specifications under which the wiring at present countenanced by safety requirements, and which is considered safe if properly inspected, may be placed. These specifications, when drafted, are to be submitted to the architect for consideration and revision, when they will be again returned to the conference meeting and formally adopted. It was the sense of the majority of the meeting that it would be inadvisable to endeavor to effect a radical change in existing methods of electrical construction, especially so in localities under the surveillance of an electrical inspector, hence, the resolution proposes to countenance ordinary methods of wiring, as defined by existing insurance requirements, in any instance where the same can be inspected by some electrician in good standing. This will necessitate the organization of an electrical exchange on the Pacific coast, similar in its nature to the New England Electrical Exchange.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

POTTSVILLE, PA.—The Mahanoy City, Shenandoah & Ashland Street Railway Company; capital, $100,000. Incorporators, Chas. Dittman, A. W. Yost and H. C. Boyer, of Shenandoah.

HAMILTON, CAN.—R. R. Waddell will apply for a charter to build an electric railway from Hamilton to Schaw.

LEBANON, PA.—The Lebanon Valley Traction Company has been incorporated with a capital of $100,000, for the purpose of building an electric railway between Lebanon, Palmyra, Annville and Myerstown.

NEW BRITAIN, CONN.—The New Britain Tramway Company has given notice that it will petition the next legislature to have the act incorporating the company amended and the charter altered so as to change the name of said company to the Central Railway and Electric Company. The railway will be extended through Plantsville, Bristol, Farmington and West Hartford, and will be operated by electricity.

MANCHESTER CENTER, CONN.—A syndicate will petition the legislature to build an electric line to connect Manchester Center, Buckland, Talcottville and Rockville. Among the backers of the scheme are M. S. Chapman and N. T. Pulsifer, of Manchester, and A. D. Claflin, of Boston.

WASHINGTON, D. C.—Senator Hunton, of Virginia, has introduced a bill to incorporate the Washington and Marlboro Electric Railway, of the District of Columbia. The incorporators are Jas. G. Berrett, Chas. E. Creecy, Wm. I. Hill and Robert A. Howard.

MUNCIE, IND.—At a recent meeting of the city council a franchise was granted to the Citizens' Electric Street Railway Company.

SEATTLE, WASH.—T. C. Todd, of Boston, a heavy stockholder in the Fairhaven and New Whatcom Electric Street Railway, is negotiating for purchase of property.

BAY CITY, MICH.—A Philadelphia syndicate has bought the electric railway in West Bay City and the horse railway in this city, in all over 20 miles of road. The horse lines will be equipped with electricity.

BRAZIL, IND.—The Brazil Rapid Transit Company has been granted a franchise for 50 years to construct an electric railway from Brazil to Harmony.

CHICAGO, ILL.—The Chicago General Street Railway Company; capital, $3,000,000. Incorporators, Lyman M. Payne, H. L. Burnett and Charles L. Hull.

ROCKVILLE, CONN.—Notice has been given of the proposed application to the legislature for a charter for the Rockville, Stafford and Southbridge Electric Railway. The road will connect with the proposed electric line from Hartford.

MIDDLESEX, MASS.—The Natick Electric Street Railway Company will petition the legislature for permission to change the name to The South Middlesex Street Railway Company.

BEVERLY, MASS.—The extension of the electric railway to Gloucester is now an assured fact, and papers for the incorporation of the new line to operate between the two points, a distance of some 14 miles, have been filed. The incorporators are W. H. Jordan, W. F. Parsons, of Gloucester, and H. W. Peabody, of Salem.

HARRISBURG, PA.—The West End Electric Light Company has been chartered. The incorporated capital is $5,000. The directors are Evan Jones, T. P. Hirshberger, W. C. Gundelfinger, James Fox and A. C. Robertson.

CLEVELAND, O.—The Cleveland City Cable Company will equip its St. Clair street line with electric power.

TROY, N. Y.—An electric railroad will probably be built to Sandlake.

WAUSAU, WIS.—John D. Ross, W. Alexander and H. Dunfield have made a proposition to the city council for a street railway franchise.

JANESVILLE, WIS.—An electric car line, 18 miles long, is projected, to run from this city to Johnstown.

ALTOONA, PA.—The Altoona and Logan Valley Electric Railway Company has been incorporated with a capital of $175,000. John Loyd, president, and Cornelius Campbell, secretary. The line will be 15 miles in length.

MOUNT VERNON, WASH.—The Mount Vernon, Bayview and Northern Railway has been organized to build an electric railroad, with the following officers: President, Harrison Clothier; vice-president, H. P. Downs; treasurer, C. S. Moody; secretary, F. L. Crampton; trustees, Harrison Clothier, H. P. Downs, Otto Klement, J. B. Moody, E. H. Harrison, J. F. St. John, G. E. Brand, W. J. McKenna, Fred. E. Pape. The capital is $150,000, divided into 3,000 shares at $50 each.

FLATLANDS, N. Y.—The certificate of incorporation of the Flatlands Electric Light and Power Company has been filed in the county clerk's office. The capital stock is fixed at $50,000. The directors for the first year are M. L. Towns, Francis Gross, Henry A. Gebhardt, Frank Maier and N. W. Livingston.

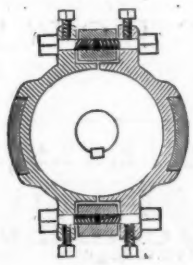


FIG. 2.

JEANNETTE, PA.—Jeannette is to have an electric street railway. A company of $30,000 has been organized. The line will extend from Jeannette to Penn station, and in the future likely to Manor.

CLEVELAND, O.—It is proposed to construct an electric belt railway around this city, to be owned by the city.

READING, PA.—The East Reading Electric Railway Company is seeking for a franchise to extend its lines.

FRANKLINVILLE, N. Y.—W. H. Ferris and D. A. Spring have presented a proposition to put in an electric light plant.

LANCASTER, PA.—A charter has been granted to the Maytown and Marietta Electric Street Railway; capital, $24,000.

Electric Light and Power.

GREENFIELD, IND.—O. C. Irwin & Company have disposed of their electric light plant to the Greenfield Electric Light and Power Company. The new company has organized and elected Chas. G. Offutt, president, and Robert Thompson, secretary.

HENDERSON, N. C.—Maurice W. Thomas has purchased the property of the Henderson Electric Light and Power Company and will put in an incandescent system.

PUNXSUTAWNEY, PA.—The Punxsutawney Street Passenger Railway Company will put in an electric light plant in connection with their railway.

WINDSOR, ONT.—The People's Electric Light Company will build a new power house.

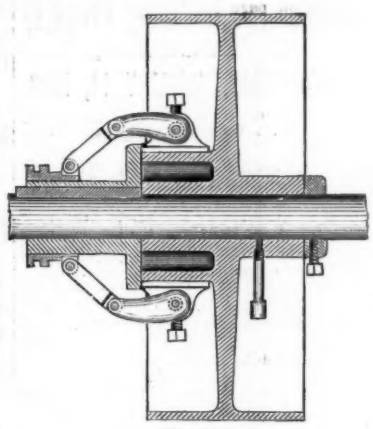


FIG. 1.

KNOWLTON, QUE.—A. W. Pattes and E. Mills are arranging to put in an electric light plant here.

AMBLER, PA.—The Ambler Electric Light, Heat and Motor Company; capital, $15,000. Directors, Henry Griffith Keasbay, Ambler; Richard V. Mattison, Upper Dublin; Geo. R. Wallace, Fort Washington.

EFFINGHAM, ILL.—The Effingham Electric Light and Power Company; capital, $15,000. Incorporators, Edward Austin, Calvin Austin and Dennis Busher.

NEWCASTLE, IND.—The city council has voted to purchase and operate an electric light plant.

WEST HAVEN, CONN.—The West Haven Electric Light and Power Company, capital stock $50,000, has been incorporated by Wm. H. Brown and others.

PHILLIPS, ME.—The people of Phillips have decided to erect an electric light plant. A company has been formed and all the stock taken, and a contract made to have the plant in running order in four weeks.

CALDWELL, TEX.—The Caldwell Water Works, Electric Light and Ice Company; capital, $50,000; M. P. Kelley, B. R. Copeland and A. T. Bradshaw.

CHICAGO, ILL.—The Chicago Underground Subway Company has been incorporated by George W. Jackson, Joseph J. Duffy and Thomas J. McNichols. The concern proposes to construct a network of connecting subways 40 feet below the surface of the streets. Space will be rented to electric light, telephone and gas companies.

INDIANAPOLIS, IND.—The Automatic Electric Signal Company; capital, $200,000. A. F. Kopp, president, and W. S. Barkley, secretary and treasurer.

GRAND RAPIDS, MICH.—The Grand Rapids Electric Company; capital, $25,000. Incorporators, D. D. Cody, Daniel McCoy, C. M. Ayer and R. S. Barnhardt.

MINNEAPOLIS, MINN.—The Cooley & Vater Company; capital, $500,000. The company will manufacture engines, boilers and electrical supplies.—The International Carpenter Electric Heating Manufacturing Company has been incorporated with a capital of $400,000.

CHATTANOOGA, TENN.—The Chattanooga Telephone and Electric Company has been granted a franchise by the board of public works. Hugh Whiteside, A. M. Johnson and R. M. Barton are directors of the company.

WASHINGTON, D. C.—The Domestic Electric Power and Light Company, for the sale of electric machines and patents, has filed a certificate of incorporation. Albert Ordway, E. H. Neumyer and H. S. Barbour are the incorporators.

Increase of Capital Stock.

CLEVELAND, O.—W. D. Graves Electrical and Manufacturing Company has filed articles with the Secretary of State increasing its capital from $25,000 to $75,000.

Barnes Friction Clutch Pulleys.

The accompanying cuts represent the principles of one of the latest improvements in the line of friction clutch pulleys and cut-off couplings manufactured by the J. H. & D. Lake Company, of Hornellsville, N. Y.

Fig. 1 affords a sectional side view of the Barnes screw lever friction pulley in released position, showing the driving hub keyed to the shaft.

Fig. 2 is a sectional end view describing the friction hub encircled by friction ring, the former of which is cast in one solid piece with the pulleys. Projecting lugs on opposite sides of the driving hub of the ring drop into lugs, or lug cavities, of the friction ring; and when the clutch is on these lugs take all the driving power. This is an improvement over the old bolt-fastening system, the bolts of which are more liable to be affected by the twisting strain upon the hub from the friction of the clutch. At the extreme top and bottom of Fig. 2 is shown a view of a simple device which evades the use of much complicated machinery, and more than substitutes the corresponding complex parts of some previous inventions. It is a lever nut on each side of the friction ring, one-half of the nut being cut with a right thread and the other half with a left thread. Sufficient space between opposite sections of the ring is given for contraction or clutch, which is effected by means of right and left thread screw bolts entering the lever nut from opposite sides, secured by set-screws. Duplex levers are attached to these nuts at their upper section and to the hub at their lower section. When the shipper sleeve is thrown against the flange by the operating lever, the duplex lever turns the nut sufficiently to produce a friction that was never known to lose its grip, nor has a thread of these screw-bolts ever been known to break. The screw-bolts are adjustable to any desired pressure, however, in case the clutch should ever become lax. They give the pulley a positive grip and absolutely release from the hub by each opposite shift of the operating lever, without the use of springs. The Barnes screw lever friction clutch pulleys and cut-off couplings are adapted to both heavy and light work.

The Buffalo General Electric Company Sustains a Loss By Fire.

The Thomson-Houston plant of the Buffalo General Electric Company, located on Court street, was badly damaged by fire on December 16. The fire broke out at the switchboard, near the rear of the building. The night men were at work in the building and an alarm was quickly turned in. This was at 4.55 A. M. There is apparatus in the building for fighting fire, and the men endeavored to use it, but the flames spread so rapidly that their efforts were unavailing. When the firemen arrived the fire was fierce.

In a few minutes it was found that the fire was upstairs, having followed the wires from the switchboard, and in a short time thereafter it had jumped 100 feet from the repair shop on the Pearl street side.

There was quite an extensive and disastrous blaze in the repair shop, and between it and the switchboard there is a considerable space almost untouched.

The loss will reach $50,000. There were in the great room nine arc dynamos, four incandescent dynamos, and the generator used to supply power to several small concerns in the city. The dynamos and generators are practically ruined. The switchboard and wiring are utterly destroyed. The loss is covered by insurance.

KINDRED INTERESTS

The Berlin Iron Bridge Company, of East Berlin, Conn., have the contract for three new iron buildings and iron roofs for the East River Gas Company, to be built at Ravenswood, L. I.

The Bickford & Francis Belting Company, 51 Exchange street, Buffalo, N. Y., who recently installed a 72-inch double belt in the Brush station of the Buffalo General Electric Company, have just completed a 56-inch three-ply belt for the same station.

The Shultz Belting Company, of St. Louis, through its New York manager, Mr. A. B. Laurence, has sent us a very interesting pamphlet called, "Do You Use Machine Belting?" This book is of value to all engineers and belt users, who may obtain it and a calendar for 1893 by asking for them.

Taylor, Goodhue & Ames, 827 Monadnock Block, Chicago, dealers in high grade electrical specialties, have been appointed selling agents for the well known Burton electric heaters and have just issued a very tasteful pamphlet entitled, "Electric Heating," which describes the operation and many uses of the Burton heaters.

Queen & Company's Testing Sets.

Queen & Company, Philadelphia, are meeting with great success in exploiting their standard portable testing sets. One purchaser says:

The portable testing set referred to has been in use constantly since we received it, and we find it to be first-class in every respect.

Have used it on all kinds of work, for both high and low measurements, and think it is about as complete an instrument of the kind as I have ever used.

Another writes:

In answer to your inquiry under date of November 21st, would say that testing set No. T 305, marked 487, has given us most satisfactory results, and we feel thoroughly well satisfied with it in detail.

It has won our confidence to the extent that we accept it as a standard, not only as a portable instrument, but in a greater share of our laboratory work and electrical measurements.

It is correct to within a small degree, easily manipulated, and results quickly obtainable, and can say that we do not know of one single point left to be desired in this instrument for an instrument of this nature.

These instruments are made in a strictly first-class manner, and are adapted for use under the most exacting conditions, such as in a man-hole or close to dynamo machinery. They are fully described in circular No. 285, issued by the makers.

LITERARY.

"Reports from the Consuls of the United States" for September, 1892, have been received.

The Marquis de Chambrun, whose death occurred in September, 1891, left among his papers some personal recollections of President Lincoln during the closing months of his career. This paper will appear in *Scribner's Magazine* for January, and contains a pen picture of the assassination and death of the President, which has never been surpassed.

A revised and enlarged edition of Badt's "Dynamo Tender's Hand Book" has been put upon the market at the same price as the former edition, $1. The new book contains 226 pages and has much information of great value to dynamo tenders and others interested in the management of central stations or isolated plants. One dollar sent to our Book Department will procure this valuable publication.

The article by Mr. Gladstone in the October number of the *North American Review* on Home Rule, in reply to the article by the Duke of Argyll in the August number, awoke the liveliest interest on both sides of the Atlantic. These papers will be followed in the *Review* for December by an exceedingly interesting statement by the Hon. Arthur James Balfour, late Secretary for Ireland, of the difficulties which Mr. Gladstone's administration is likely to encounter in dealing with the Home Rule question.

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The Richmond Paper Co. Estate,
Consisting of about 28 acres of land in East Providence, R. I., three miles from the City of Providence, upon the Seekonk River, and upon the Providence and Worcester Railroad, affording excellent water and railroad communication.
The BUILDINGS are mainly of brick, and of the following dimensions:
One building 160x65; four stories.
One building 200x50; one story, with attic.
Two buildings 150x60; one story.
One building 200x30; one story.
One building 200x40; one story.
One building 130x60; one story.
The one story buildings are constructed with walls suitable for an additional story.
Also engine house, boiler house, water filter beds and a large boarding house and several tenements.
The STEAM PLANT consists of two Greene improved engines of 600 horse-power each, and 14 six feet horizontal tubular boilers, in good order.
The WATER SUPPLY is abundant and of the purest quality.
Terms of sale: Five per cent. of the purchase money in cash at the time of sale and the remainder upon the delivery of the deed at the banking house of the Rhode Island Hospital Trust Company, in the City of Providence, on the 25th day of January, 1893.
THE RHODE ISLAND HOSPITAL TRUST COMPANY, Trustee.

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For Arc or Incandescent Circuits.
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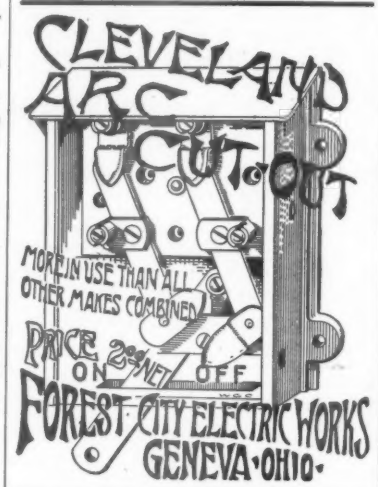

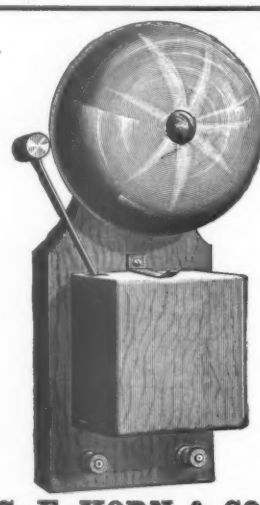

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Planers, 16 in. x 16 in. x 5 ft.; 20 in. x 20 in. x 4 ft.; 24 in. x 24 in. x 6 ft.; 30 in. x 30 in. x 6 ft.; 36 in. x 36 in. x 10 ft.; 42 in. x 42 in. x 12 ft.; 44 in. x 48 in. x 22 ft.; 60 in. x 49 in. x 24 ft.
Friction Shapers, 15 in., 16 in., 20 in., 22 in., 32 in.
Crank Shapers, 6 in., 8 in., 10 in., 12 in., 13 in., 16 in., 17 in., 20 in., 24 in., 28 in.
Screw Machines, Nos. 1, 2, 3, 4, with or without Wire Feed.
Screw Machines, Nos. 5, 6, 7, 8, Power Feed.
Presses, Nos. 51, 52, 53, Ferracute; Nos. 1, 2, 3, Stiles & Parker.
5 Lincoln Pattern Millers, No. 2.
Hand Millers, Nos. 1 and 2. 3 Cam Cutters.
Bolt Cutters, ¼ in. to 1 in., ½ in to 2 in.
2 Profiling Machines. 1 36 in. and 48 in. Gear Cutter.
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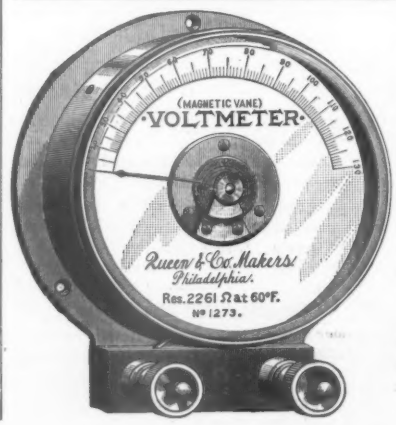

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